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DEPARTMENT OF THE INTERIOR

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

PROPOSED 1982 OUTER CONTINENTAL SHELF OIL AND
GAS LEASE SALE OFFSHORE SOUTHERN CALIFORNIA

OCS SALE NO. 68 VOLUME 1 OF 2

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1982 OUTER CONTINENTAL SHELF OIL AND GAS

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OCS SALE NO. 68 VOLUME 1 OF 2

Prepared by

Bureau of Land Management
Dept. of the Interior

Director
Bureau of Land Management

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SUMMARY

1. Preliminary Information

Proposed OCS Oil and Gas Lease Sale No. 68

Draft (X) Final ( ) Environmental Impact Statement

Type of Action:

Administrative (X) Legislative ( )

Lead Agency:

United States Department of the Interior
Bureau of Land Management
Pacific Outer Continental Shelf Office
1340 W. Sixth Street, Room 200
Los Angeles, CA 90017

Contacts:

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Area of Project Impact:

Offshore and onshore areas, Southern California

2. Description of Area and Proposed Action

This Environmental Impact Statement (EIS) was prepared by the Bureau of Land Management's Pacific Outer Continental Shelf Office. It implements the Council on Environmental Quality's (CEQ) regulations regarding format and scope of an EIS.

Proposed OCS Sale No. 68 includes a maximum offering of 218 tracts, with a total area of about 445,190 hectares (1,112,975) acres). The tracts are offshore Southern California, between 3 and 84 geographic miles offshore and in water depths from about 46 to 1500 m deep (150 to 4,900 feet). Tracts comprise three subareas: the Santa Barbara Channel; Inner Banks (containing the Anacapa Island area, Santa Monica Basin and the San Pedro area); Outer Banks (containing the area south of Santa Rosa Island, San Nicolas Basin, Dall Bank, southeast Tanner Bank and Santa Tomas Knoll). There are existing Federal oil and gas leases in each of these three subareas.

Geological Survey estimates the most probable resource amounts (conditional mean) for each of the subareas as follows: Santa Barbara Channel, 67 million bbl of oil, 133 billion cu. ft. of gas; Innner Banks, 70 million bbl of oil, 93 billion cu. ft. of gas; and Outer Banks, 93 million bbl of oil, 436 billion cu. ft. of gas.

3. Issues and Areas of Concern

Coordination with Legal Agencies

As authorized by the OCS Lands Act, as amended, the Bureau of Land Management (BLM) and the U.S. Geological Survey (USGS) serve as the primary Federal agencies administering these sales. They are in constant coordination with each other throughout the presale processes and the production phases, as well as coordinating as appropriate with other Federal, State, local, and non-governmental agencies and organizations.

Determination of Public Issues and Areas of Concern

The Council on Environmental Quality (CEQ) requires "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action." The scoping process for proposed Sale No. 68 began in August, 1980. At that time, State and local governmental units, non-government agencies and organizations, and the general public were invited to a series of meetings in Newport Beach, San Pedro, Ventura, Santa Barbara, and Los Angeles. These meetings helped establish the particular issues and alternatives which would be analyzed in the EIS.

Major Environmental Issues and Areas of Concern

The scoping process and coordination with other Federal agencies identified the following environmental issues and areas as meriting special attention and emphasis in the environmental assessment process:

(1) Geological Hazards
(2) Air Quality
(3) Water Quality
(4) Marine Biological Resources
(5) Endangered Species
(6) Channel Islands National Marine Sanctuaries
(7) Commercial Fishing
(8) Recreation and Sportfishing
(9) Socio-Economics
(10) Land Use
(11) Transportation Systems
(12) Military Use
(13) Archaeological and Cultural Resources
(14) Visual Resources

4. Major Alternatives and Environmental Impacts

Five alternatives are presented. The total Sale offering is Alternative 1.

Alternative 1 - Hold the Sale as Proposed: The potential impacts of holding the Sale as proposed are briefly summarized below.

1. Physical Environment: Impacts in this category are essentially restricted to those affecting water and air quality.

-Water quality will be degraded to a distance about 1000 m from oil platforms and drilling rigs. The long-term effects of discharges from these structures are not known. The effects of drilling fluids, formation water, small chronic leaks of hydrocarbons or the expected 1.1 spills of greater than 1,000 barrels of oil in the open ocean should be minimal, given the dilution potential of open water. Should these occur in, or migrate into restricted bays or estuaries such as Upper Newport Bay, severe water quality degradation would result. The the cumulative effects of dumping of drill cuttings resulting from Sale 68 and previous sales will begin to be significant, however, in general, the water quality impacts from petroleum hydrocarbons are expected to be of minor importance in the Southern California Bight in relationship to the large volumes of municipal discharges of oil and grease. Again, the long-term cumulative effects are not known.

-Air quality onshore will be impacted due to increased emissions of hydrocarbons and nitrogen dioxide. Lesser quantities of sulfur dioxide, carbon monoxide, hydrogen sulfide and particulates will also be emitted. Sale No. 68-related activities will slightly increase pollutant loadings in those areas already exceeding the air quality standards. These incremental increases are below the levels considered significant by the DOI air quality regulations. For those pollutants and locations presently meeting air quality standards, the slight project-related contribution to pollutant concentrations are not expected to cause new exceedences of the standards.

ii. Biological Environment

-Plankton, the impacts of oil and gas activity from lease Sale No. 68 on both phytoplankton and zooplankton should be insignificant.

-Intertidal impacts (to the benthos) from oil spills are predicted to be low to moderate in most cases. Rocky intertidal areas within the Southern California Bight are generally more sensitive than sandy intertidal areas. The oil spill model predicts a low probability of a spill reaching shore. One land segment within Ventura County has a 5 percent probability of a hit while Santa Catalina Island with a 13 percent probability and Santa Cruz Island with a 6 percent probability are the only segments having a greater than 5 percent probability of a hit within 30 days (for a spill of 1,000 bbl or greater).

Several sensitive rocky intertidal areas or species may experience a high ecological loss if a spill occurs. These areas/species are: 1) intertidal pools of the northwest coast of San Nicolas Island, 2) air breathing intertidal limpets of Santa Barbara Island, 3) algae (Pelvetia) beds and abalone herds of Santa Rosa Island's northern coast. The potential impacts to the Channel Islands National Marine Sanctuary should be reduced if the tracts within the sanctuary are not leased.

-Subtidal bottom communities would generally suffer a low ecological loss from either an oil spill or drilling operations. Generally, rocky bottoms are more impacted than soft sediment bottoms. Specific areas with benthic assemblages which could suffer a high ecological loss from oil operations are: 1) the rocky outcrops off Point Conception, which may contain unusual benthic assemblages, due to the unusual location of the area at the division point of two biogeographic provinces, 2) Santa Rosa-Cortes Ridge, because of its unusual species, 3) Tanner and Cortes Banks because of its highly productive community and coral population. The potential impacts to the benthos of the Channel Islands National Marine Sanctuary should be reduced if the tracts within the sanctuary are not leased.

-Fish and fisheries probably will be impacted in the event of an oil spill. Although there are too many variables to accurately predict these impacts, low to moderate ecological losses may occur to surface fishes (e.g., Pacific bonito, jack mackerel, northern anchovy, California grunion), and temporary economic losses may be incurred by the fishing industry. The magnitude of the losses to the fishing industry will depend, in part, upon whether or not the vessels are confined to port by oil containment booms. Impacts from oil spills probably would be greatest in the Inner Banks since this area encompasses the region's most productive fishing grounds and ports.

Manmade structures could impact fish and fisheries if they disrupt the critical habitat of a species. It is not possible to determine how significant this impact will be. Mud mounds and trenches from the anchors of pipelaying barges probably will create a high impact to commercial trawlers in the Santa Barbara Channel unless a way is found to resolve this conflict. Other impacts from offshore structures are expected to be minor. No losses are anticipated from competition between the oil and gas industry and the fishing industry for berthing spaces and support services. The impact of trace metals in drilling muds on fish and fisheries is unknown. Vessel traffic, particularly seismic boats, may temporarily cause moderate impacts to the commercial fishing industry.

-Marine mammals and seabirds that frequent the waters of the Southern California Bight are, to some extent, vulnerable to impacts associated with offshore oil and gas development activities. The nature and extent of these impacts vary from species to species, season to season, and area to area within the Bight. For the two SCB (Southern California Bight) fur seal populations, oil contamination of the fur can result in hypothermia, loss of bouyancy, and death. All pinniped rookeries within the SCB are sensitive to disturbance from human intrusion; nursing pups may also be exceptionally vulnerable to the ingestion of oil. Whale species which use large sections of the Bight in their bi-annual migration, along with resident pilot whale, porpoise, and dolphin species, may be adversely affected by oil contact, noise from exploratory and development activities, and the indirect effects of resource development on the OCS environment. Seabirds of the SCB, whether nesting (resident) or migratory, may be adversely affected by oiling of plumage or the disturbance of breeding colonies and/or nesting sites. It must also be noted that projections as to the number of oil spills to result from Sale No. 68 activity are very low. These probabilities indicate that Sale No. 68 impacts on marine mammals and seabirds of the SCB will be low.

-Estuaries are potentially one of the most sensitive biological resources to oil spills. If a large oil spill were to enter an estuary, a high ecological loss would result. However, most estuaries in Southern California have narrow openings, making it relatively easy to prevent oil from entering. Also, the probabilities of a hit, predicted by the oil spill model, are very low.

It is apparent, therefore, that the Southern California estuaries are not likely to be impacted.

-Terrestrial biological resources are not expected to be impacted.

iii. Socio-Economic Environment

-Demographic changes associated with Sale No. 68 economic activity are closely related to the number of new jobs. Population increases for the Southern California region are also expected to peak in 1992. The distribution among the Sale area counties for the peak year is: Santa Barbara 2,027; Ventura 1,651; Los Angeles 4,270; Orange 1,086; and San Diego 417.

-Coastal economic conditions will be affected. The development of the proposed OCS Sale No. 68 lease area would stimulate investment and would generate jobs in the Southern California region. The direct employment in offshore oil and gas activities would peak in 1986 at approximately 400 jobs. According to the results of the Curtis Harris Economic Model, this would generate indirect and induced employment in many other sectors of the economy. The total effect on employment, at its peak in 1992, would be an estimated 4,526 jobs. The majority of the jobs would be located in Los Angeles (2,089), Santa Barbara (843), and Ventura County (803).

-Public facility requirements may be affected by increases in the population, with a demand for additional public and private services and facilities such as schools, housing, health facilities, fire and police protection, and water supply and sewage treatment facilities. Localized stress could occur on sewage treatment facilities, especially in some of the coastal communities. However, the most significant regional impact could be on water supply systems. Sale No. 68 induced population growth could put additional stress on the ability to provide adequate water supplies.

-Land use impacts, from Sale No. 68, are expected to be minor. This is due to the present level of industrialization in the Sale area. At present there is an oil and gas infrastructure in the area, and this should absorb any additional need for onshore facilities. Local land use plans, sewage and water moratoriums, and local zoning policies will be of help to the local communities in regulating and restricting the total development of their own areas.

-Recreation impacts will probably be very localized and short term, with only mild economic consequences. Due to the number of non-water oriented tourist facilities in the area the impact on the recreation industry is expected to be minor, even in the event of a major pollution incident.

-Refineries. There should be no impacts on refineries in the Los Angeles basin based on the following assumptions:

(1) Refineries have the capabilities and would process all of the crude oil from proposed Sale No. 68.

(2) Crude from Sale No. 68 would back out an equal amount of either foreign or Alaskan crude oil.

However, significant impacts could occur if crude from the Sale were of such quality that it could not be refined locally. In this case, expensive modification to the refining process might be required.

-Transportation systems. The proposal could cause the following impacts: 1) some increased employment in the shipping industry and at the ports; 2) some increased use of limited space and port resources; 3) rerouting of ship traffic, delayed entry or departure of ships from ports, and short-term delay in operation of power plants requiring ocean water cooling, in the event of a major spill; 4) increased cost of exploration and development due to traffic lines crossing proposed tracts; 5) slight increase in vessel accidents; 6) small increase in the number of pipeline failures, causing oil spills; and 7) minor increases in traffic movements on highways, railroads, and at airports.

-Militarily, several tracts are being evaluated that fall within the Pacific Missile Test Center, San Clemente Island Test Range and the Long Beach Naval Shipyard. Further Department of Defense/Department of the Interior negotiations are in progress to achieve a mutually satisfactory resolution.

-Cultural resources could be impacted as described below. This proposal could commit some areas of relatively shallow waters of the OCS to a permanently disturbed condition by placing large and relatively permanent sources of magnetic anomalies on the seafloor during the life of the proposed project. Because of the apparently wide distribution and the density of resources on the OCS, and because of the amount of industrial activity expected as a result of this proposal, it is possible there will be some loss of historic and prehistoric archaeological sites on the OCS.

-Visual resource impacts from OCS development cannot be quantified with exact certainty. However, there are some areas in which severe impacts would occur from OCS development, in most areas the impacts would be minimal.

Alternative 2 - Modify the Sale: Modify the Sale, by Deleting Tracts to Reduce Potential Conflicts with the Channel Islands National Marine Sanctuary.

This alternative consists of deleting the 13 complete and 24 partial tracts located within the sanctuary. No drilling would be allowed on any portion of any tract within the sanctuary. These tracts total approximately 38,000 hectares (94,000 acres), which is only 8.4 percent of the total proposed offering. Less than 3 percent of the total oil and gas resources estimated for the entire proposal, are located within the sanctuary.

The adoption of Alternative 2 would result in a significant reduction in potential impacts to intertidal and subtidal benthic organisms, marine mammals and seabirds. Potential impacts to recreational and cultural resources would be reduced slightly. For the other resource categories discussed in this document, potential impacts are not expected to be significantly different from those described for Alternative 1.

It is important to note that the unusual and valuable intertidal, subtidal benthos, pinnipeds, seabirds, recreational and cultural resources were major reasons the area was designated as a National Marine Sanctuary and a National Park. Adopting Alternative 2 (deleting tracts within the sanctuary) would be a valuable step in maintaining the characteristics and qualities that were prime reasons for designating the Northern Channel Islands as a marine sanctuary and a National Park.

Alternative 3 - Cancel the Sale: This alternative would constitute the no action alternative. The activities associated with the proposal would not occur. All potential physical and biological impacts arising from the discharge of drilling muds, cuttings, formation water and sewage, and those resulting from population shifts or the placement of rigs, pipelines, and related structures, would be eliminated.

If cancellation should occur, it will not preclude all oil and gas activity in the Southern California Bight. Exploration and development will continue as a result of the 1968 Sale and Sale Nos. 35 and 48, and, where commercial discoveries are made, production activities could result. In addition, another two California Sales are included on the 5-Year Leasing Schedule and it is possible that tracts in the Southern California region could be included in these proposals. If proposed Sale No. 68 were cancelled for any reason, any of the tracts included in it could possibly be renominated for a later Sale.

Cancelling the Sale will eliminate all the impacts that are expected to result from the proposal, but not all impacts from oil and gas activity in the Southern California region, since exploration and development is continuing from the previous Sales. Although impacts related to oil spills from the proposal would be eliminated, the continued importation of oil via tankers is expected to result in spills.

Realization of economic or national security benefits resulting from the estimated oil and gas resources would be foregone unless tracts from this Sale were incorporated into a future Sale. Cancelling the Sale would also eliminate all regional increases in economic activity expected to occur as a result of the proposal. The jobs and increases in gross regional product foregone represent a less than 1 percent decrease over baseline projections. However, possible stress on communities associated with the Sale-related population growth would not occur if the Sale were cancelled.

Alternative 4 - Delay the Sale: If the alternative of delaying the Sale is chosen, tracts would be withheld from a Sale offering for a period of time.

Postponement of the Sale would result in delay in the exploration, development, and production of Sale No. 68 oil and gas resources. Any economic or national security benefits which could be attributed to the domestic production of hydrocarbons in these amounts would be postponed.

A delay of the Sale may not change any of the impacts assumed to occur under Alternative 1; it would most likely postpone their occurrence. However, improvements may occur in technologies for oil spill prevention and recovery, deep water drilling, or for exploration and production in hostile environments which may lessen the risk of some adverse impacts.

Alternative 5 - Other Alternatives: The purpose of this alternative is to emphasize that the Secretary can choose any combination or partial combination of tracts discussed in the preceding alternatives. For example, the Secretary might choose to delay leasing tracts within the marine sanctuary, but offer the remainder as proposed. The alternatives previously discussed are not intended to represent all possible alternatives to the proposed action.

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CHAPTER I

I. PURPOSE AND NEED FOR ACTION AND DESCRIPTION OF PROPOSAL

A. Purpose and Need for Action

The United States currently produces about 54 percent of the oil it consumes. Since 1973, higher energy prices have reduced the growth rate of energy demand. Nevertheless, the absolute demand for energy (including oil and gas) has continued to increase. Most analysts believe this trend will continue (Franssen, et al. 1978). The U.S. petroleum deficit is a result of this continuing increased useage and a declining domestic production. Between 1973 and 1977, for example, U.S. oil production declined by 1.2 million barrels per day, while use increased by 1.0 million barrels per day (U.S. Dept. of the Interior, 1980). If these trends continue, by 1985 petroleum imports are projected to be 80 percent higher than they were in 1975 (U.S. Dept. of the Interior, 1980). This dependence upon foreign oil has obvious economic, military and diplomatic implications.

The Congress, the President and the Departments of Energy and Interior have based their energy program largely on increasing domestic energy production and increasing conservation. One component of that policy involves leasing Federal land for oil and gas development, including Federal lands on the Outer Continental Shelf (OCS).

The Outer Continental Shelf (OCS) is defined as all submerged land lying seaward of the State boundary, generally (and in California) three geographic miles from shore, and of which the subsoil and seabed appertain to the United States and are subject to its jurisdiction and control. (See OCS Lands Act 1953, Submerged Lands Act 1953.) The Federal Government is required to manage the exploration and development of oil and gas resources within this zone.

While overseeing this development, the Federal Government must balance orderly resource development with protection of the human, marine, and coastal environments, ensure that the public receives a fair return for these resources, and preserve and maintain free enterprise and competition. In view of the growing imbalance between domestic oil and gas production and use, especially the expected decline in production from prime areas such as the Gulf of Mexico and the North Slope, there is a greater need to develop resources from the OCS frontier areas.

The U.S. OCS constitutes the last major frontier for domestic petroleum and natural gas exploration. To a large extent, OCS areas around all U.S. coastlines consist of sedimentary rocks of the general types in which oil and gas are found. The U.S. Geological Survey suggests that 32 percent of all undiscovered oil resources within the United States may exist in the OCS to a water depth of 200 m (approximately 656 feet) and 22 percent of similarly defined natural gas resources may be located on the OCS (Miller, et al. 1975).

The unique character of the OCS with regard to potential energy supply does not stem solely from the magnitude of undiscovered resources which may be located there. It can be managed in a manner consistent with national energy policy objectives. The OCS is an area where the Federal Government can have a positive impact on domestic production. By holding lease sales of OCS lands, the goverment can encourage domestic exploration, development, and production of oil and gas.

In order to ensure correlation of leasing policy with overall energy policy, a memorandum of understanding was signed in September 1978 between the Departments of the Interior (DOI) and Energy (DOE). The memorandum calls for DOE to set production goals, on a resource by resource basis, for all Federal leases. The Amendments to the OCS Lands Act, signed into law in September 1978, contain a provision requiring DOI to prepare a 5-year plan indicating the size, timing, and location of OCS leasing activity which will best meet national energy needs. In May 1979, DOE transmitted to DOI final OCS oil and gas production goals for those years included in the schedule. In June 1980, the Department of the Interior announced final approval of the 5-year planning schedule (June 1980 through June 1985) for oil and gas leasing on the OCS. Proposed OCS Lease Sale No. 68 offshore Southern California is part of the schedule. The following Section (I.B.) details those administrative events that are involved in proposed OCS Sale No. 68 and describes the proposed Federal action in more detail.

B. Description of the Proposal

1. Description of the Proposal: This proposed Federal action is a June 1982 Sale of oil and gas leases on the Outer Continental Shelf (OCS) offshore Southern California (See Figure I.B.1.a-1). This proposal is also referred to as Alternative 1.

a. Location and Hectarage of Proposed Sale: The proposed Lease Sale includes 218 tracts with a total area of about 445,190 hectares (1,112,975 acres). The tracts comprise three subareas. See Figure No. I.B.1.a-1 showing geographical areas included in the Sale. Information on subareas is shown in Table I.B.1.a-1.

The subareas are geographically located in the following offshore areas: The Santa Barbara Channel containing the western, and eastern Santa Barbara Channel; Inner Banks containing Anacapa Area, Santa Monica Basin and the San Pedro Area; Outer Banks containing the area south of Santa Rosa Island, San Nicholas Basin, Dall Bank, Southeast Tanner Bank and Santo Tomas Knoll. The tracts range from Point Conception to south of San Clemente Island and lie in waters from about 46 to 1,500 m deep (150 to 4,900 feet). The tracts are no closer than three geographic miles from shore and range seaward to 84 miles.

After Sale No. 68 tract selection was completed, the Northern Channel Islands were designated as a National Marine Sanctuary. The boundary of the Channel Islands National Marine Sanctuary includes 13 complete and 24 partial tracts. Since drilling may be prohibited within this sanctuary and since relevant decision points have not yet been reached for the Secretary to change the basic tract selection, an Alternative (2) is included to delete the tracts within the sanctuary. The proposal (Alternative 1) assumes normal hydrocarbon development within the 37 marine sanctuary tracts.

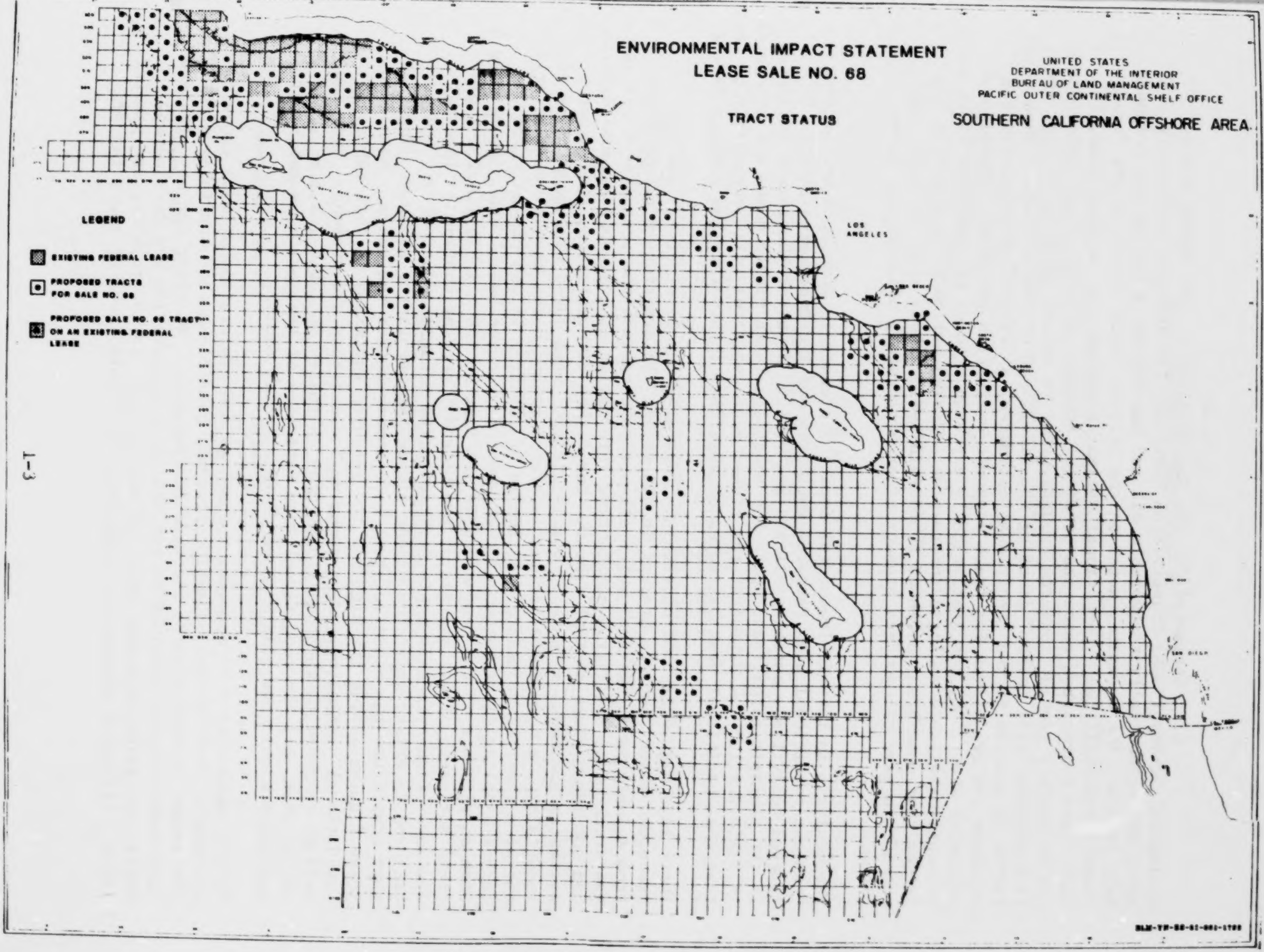
ENVIRONMENTAL IMPACT STATEMENT
LEASE SALE NO. 68
TRACT STATUS
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
PACIFIC OUTER CONTINENTAL SHELF OFFICE
SOUTHERN CALIFORNIA OFFSHORE AREA
LEGEND
EXISTING FEDERAL LEASE
PROPOSED TRACTS FOR SALE NO. 68
PROPOSED SALE NO. 68 TRACT ON AN EXISTING FEDERAL LEASE
LOS ANGELES
SAN DIEGO

Figure I.B.1.a-1 Sale No. 68, Proposed Tracts, Existing Leases

b. Estimated Oil and Gas Resources: The United States Geological Survey (USGS) Conservation Division, Los Angeles, California estimated the economically recoverable oil and gas resources within the proposed Sale tracts. The estimates noted on the left in Table I.B.1.b-1 are "conditional" probabilities. Conditional estimates assume that an area does, in fact, have hydrocarbon resources present. However, methods do not exist which can accurately provide resource amounts prior to actual drilling. Thus, there is a certain "risk factor" denoting the likelihood of hydrocarbons. When this factor is applied to the conditional estimates, a "risked" mean oil and gas estimate can be derived for track economic evaluation purposes. Risked mean estimates are, then, the statistically expected amounts of resources based on presently available geologic information. Risked estimates incorporate the factor that some areas presumed to contain hydrocarbons will, in fact, turn out not to have oil and gas present after exploratory drilling has taken place.

The analysis in this Environmental Impact Statement is developed and derived from the conditional mean resource estimates and the associated levels of related activities, assuming oil and gas will be found at the levels estimated in the geologic formations. Both the conditional and risked means are presented in Table I.B.1.b-1. Note that the risked mean estimates will necessarily be less than the conditional mean estimates because they incorporate the risking factor.

There is a high degree of uncertainty regarding the level of oil and gas resources which might be present in OCS areas. Information is extrapolated from seismic investigations which attempt to establish the presence of oil and gas structures, but little substantive information is available because drilling has not taken place on most tracts. Under such circumstances, the resource estimates encompass a range of possibilities. When faced with conditions of uncertainty, a common statistical inference method notes the values that arise out of a sampling procedure. Estimates of resource values can be based on such a sampling distribution of the expected resource base. USGS has developed such an estimate of the resource base for Sale No. 68. Table I.B.1.b-2 gives these estimates of oil and gas at the 95 and 5 percent confidence intervals. The lower figure in this table represents the minimum amount of oil and gas believed to exist, while the higher figure represents the maximum. Together they constitute the bounds of what is commonly termed the range. Note that these figures giving the high and low resource estimates in this table are "conditional" estimates, i.e., assuming hydrocarbons are present. They can only be compared to the conditional mean estimates in Table I.B.1.b-1, and, as can be seen, all the conditional mean estimates of that previous table fall somewhere within the middle range of this latter table.

Future improvements in drilling technology and exploration science can affect estimates. Furthermore, changing economic conditions can materially affect the amount of economically recoverable resources. Planning for any offshore investment program involves an evaluation of exploration and development costs, operating expenses, price of oil and gas, taxes, royalty, and production rates. Differing assumptions regarding the future level of these factors

TABLE I.B.1.a-1

AREAS INCLUDED IN PROPOSED SALE NO. 68

	Areas Hectarage	Acreage	No. of Tracts	Percent of Sale Area
Santa Barbara Channel	183,656	453,815	90	41
Inner Banks	151,353	373,992	75	34
Outer Banks	115,406	285,168	53	25
Total	450,415	1,112,975	218	100

TABLE I.B.1.b-1

ESTIMATED ECONOMICALLY RECOVERABLE OIL AND GAS RESOURCES IN PROPOSED SALE AREA

	Conditional Mean		Risked Mean	
Area	Oil (Mil. Bbl.)	Gas (Bil. Cu. Ft.)	Oil (Mil. Bbl.)	Gas (Bil. Cu. Ft.)
Santa Barbara Channel	67	133	63	126
Inner Banks & Basins	70	93	35	46
Outer Banks & Basins	93	436	23	108

TABLE I.B.1.b-2

ESTIMATES OF LOW AND HIGH RESOURCE LEVELS IN PROPOSED SALE AREA (Conditional Probabilities)

Area	Oil (Mil. Bbl.)	Gas (Bil. Cu. Ft.)
Santa Barbara Channel	20-126	46-255
Inner Banks & Basins	16-140	22-193
Outer Banks & Basins	20-216	70-811

Source: USGS

would affect estimates of recoverable resources. Thus, estimates of resource potential used here are inherently speculative--particularly so in areas where geologic information is limited and technologic and economic factors are subject to future changes.

c. Projected Transportation and Markets: Production of proposed OCS Lease Sale No. 68 oil and gas is estimated to start in 1987 and continue until 2006 with maximum total daily production occurring during the period 1989-1993 for the three subareas. Resource supply, production, development, and transportation assumptions are based on the mean conditional estimates of oil and gas shown in Table I.B.1.b-1, unless otherwise noted. Note is made, where appropriate, in Section IV (Environmental Consequences) of the impacts on particular resource categories that would also result from the maximum and minimum estimates. Sale No. 68 crude production is expected to be refined in the Los Angeles basin refineries.

The following discussion details what are considered the most likely oil and gas transportation scenarios from each area. (A more detailed discussion of this and alternative scenarios is presented in POCS Technical Paper No. 81-1).

All oil production from this proposal is assumed to back out an approximately equal amount of either foreign or Alaskan imports to California, making more oil available for other parts of the U.S. The following discussion details what are considered the most likely oil and gas transportation methods from each area. Alternative transportation scenarios are discussed in Section IV.A.7. (A more detailed discussion of all transportation scenarios is presented in POCS Technical Paper No. 81-1).

Oil and gas production from the Santa Barbara Channel area is assumed to be transported from the offshore platforms to shore by pipelines. Oil is expected to be processed on the platforms; gas, in the offshore processing facility. Oil and gas from the platforms in the West Side Channel area are transported by pipelines to an onshore location which is just east of Point Conception. Both pipelines continue east and make pipeline connections at the Las Flores Canyon. Gas line connects to the proposed gas processing facility; oil, to the proposed Santa Barbara County pipeline. Oil and gas from the platform in the East Side Channel area are transported by pipelines and connect to existing offshore pipelines near Carpenteria. For the optional transportation route, crude oil in the Santa Barbara Channel area is assumed to be transported from onshore storage tanks by barges to refineries in the Los Angeles Basin (see Mini Visual-Transportation).

Oil from the Outer Banks area is expected to be transported by barges to the Los Angeles - Long Beach Ports where existing pipelines tie with the Los Angeles Basin refineries. The volume of gas, however, is expected to be insufficient for transportation by pipelines or by liquefying and transporting by tankers, making it likely to be reinjected into the wells.

Oil and gas production from the Inner Banks area is assumed to be transported from the offshore platforms to shore by pipelines. Both oil and gas are expected to be processed on the platforms. Oil and gas from the platform in the Anacapa - Santa Monica area are transported by pipeline to an onshore location near El Segundo. A gas line is expected to connect to a nearby existing electric generating plant. An oil line is assumed to connect to the nearby refinery or to existing oil pipelines. Oil and gas from the platform in the San Pedro area are expected to connect to pipelines near the Shell-Beta platforms. There is already an oil line from the Shell-Beta platform to shore. It is assumed that a gas line will be installed and will parallel the existing oil line. Onshore, the gas line could connect to nearby existing gas transmission line.

It is anticipated that the Sale No. 68 crude production would be refined in the Los Angeles Basin refineries which have the capability to process this crude. The limiting factors would be the crude's sulfur content and American Petroleum Institute (API) gravity rating. Because California regional crude is relatively sour (high sulfur) and heavy (low API), sweet and light crudes are needed by certain refineries in order to balance feedstocks. Since the worldwide production trend is toward the heavier and more sour crudes, incentives would likely arise which could cause refineries to invest in facilities enabling them to process those crudes which would be an increasing proportion of total supply.

The Los Angeles (LA) Basin refineries are listed in Table III.C.6-1. Presently, these refineries have a refining capacity of 1.3 million barrels per calendar day (BCD). The estimated Sale No. 68 BCD for conditional mean could be 5.4 percent of the LA Basin refineries capacity.

California OCS oil and gas has, and will likely continue, to find a variety of intermediate and final product uses. The particular composition of end uses that might result from oil and gas produced in the region depends on institutional and economic relationships that would evolve during the life of the project. Generally, products of California refineries are consumed within the State, though Nevada and Arizona are also logical markets for the products from California refineries.

d. Basic Development Assumptions: It is assumed the proposed lease sale would lead to exploration for and potential development and production of oil and gas resources in the Southern California offshore area. The oil and gas operations that would normally take place begin with geophysical surveys and geological sampling programs designed to study the age, structure, and hydrocarbon potential of the area. Shallow core holes, bottom sampling, and deep stratigraphic test holes would be drilled to provide additional geologic and geochemical information.

After leasing, exploratory (wildcat) wells would be drilled on the best petroleum prospects as suggested by the geological and geophysical data in order to locate, delineate, and characterize hydrocarbon reservoirs. These wells are usually drilled from semisubmersibles, jackups, and drillships. All three are assumed in this analysis. If commercially productive reservoirs are located, development wells are normally drilled from fixed platforms. These wells include production wells and a variety of service wells which increase the productivity of the field. The exploration phase of oil operations requires docking and onshore equipment storage, service facilities, helicopters, and attendant facilities. The development phase requires offshore and onshore hydrocarbon storage and processing facilities as well as pipelines and/or deepwater tanker ports.

Using the resource estimates noted in Section I.B.1.b, the expected development timetable is given in Table I.B.1.d-1. The numbers in each category are given in a series of three for each year, expressing the amount that would result from the low mean and high resource estimates, respectively.

Using these development timetables, resource estimates, statistical data on past oil spills, and scenarios considered reasonable and appropriate, the following further developmental assumptions were made by USGS and BLM:

1) There would be statistically expected 1.1 spills of greater than 1,000 barrels and 0.5 spills greater than 10,000 barrels from the total sale area over the life of the project. 2) No petroleum refineries are expected to be constructed in California as a result of the proposed sale. 3) Some pipelines would be required and certain levels of formation water, drilling muds and cuttings, etc., would be discharged into the marine environment as a result from the proposed sale. These items are detailed in Table I.B.1.d-2. The environmental consequences are based on all these assumptions.

Many variables would affect the types and locations of facilities that would be required to support the exploration, development, and production of oil and gas resources, if discovered, and a number of facility combinations are possible. Among these variables are the policies and controls of local, regional, State and Federal governments, and of private, corporate, institutional, and industrial landholders.

Sale No. 68 production is assumed to use certain facilities developed or expected to be developed as a result of Sale No. 48. This could include sharing of pipelines (offshore and onshore), onshore operation bases and

TABLE I.B.1.d-1

DEVELOPMENT TIMETABLE
(BASED ON LOW-MEAN-HIGH RESOURCE ESTIMATES)

SANTA BARBARA CHANNEL

	Exploratory Wells	Delineation Wells	Platforms Wells	Platforms	Subsea Completions
1981					
1982	1-3-5				
1983	2-9-16	2-6-9			
1984	3-12-21	3-8-13			
1985	3-10-17	3-10-16			
1986	1-6-10	5-16-25			
1987		2-8-12	3-9-18	1-2-1	
1988			5-13-24	1	
1989			4-12-23	1*	
1990			4-12-23		0-0-1
1991			1-6-11		0-0-1
1992					0-0-0
1993					
1994					
1995					
1996					
Total	10-40-69	15-48-75	17-52-99	1-2-3	0-0-2

INNER BANKS

	Exploratory Wells	Delineation Wells	Platform Wells	Platforms	Subsea Completions
1981					
1982	1-1-6				
1983	1-2-11	1-2-7			
1984	2-3-17	1-3-11			
1985	1-3-17	2-5-18			
1986	1-4	2-6-22			
1987		1-3-12	2-9-19	1-1-1	
1988			4-17-34	0-1*-1	
1989			2-8-16	0-0-1*	
1990					0-0-1
1991					0-0-1
1992					
1993					
1994					
1995					
1996					
Total	5-10-55	7-19-70	8-34-69	1-2*-3*	0-0-2

*Deep Water

TABLE I.B.1.d-1 (Cont.)

OUTER BANKS

	Exploratory Wells	Delineation Wells	Platform Wells	Platforms	Subsea Completions
1981					
1982	1-1-6				
1983	1-2-11	2-3-6			
1984	1-2-17	3-5-11			
1985	1-2-17	3-5-11			
1986	0-1-4	4-8-17			
1987		1-4-9	1-5-11	1-1-1	
1988			2-9-20	0-1*-2*	
1989			3-14-31	0-1-2*	
1990			4-18-40	0-1*-1	0-0-1
1991			4-18-40		0-0-1
1992			1-17-29		0-0-1
1993					
1994					
Total	4-8-55	13-25-54	15-81-171	1-4-6*	0-0-3

*Deep Water

Source: U.S. Geological Survey and Bureau of Land Management

certain platform facilities. All site-specific facilities developed for any Sale would be subject to all existing Federal, State, and local regulations, land use plans, policies, or controls. The analysis in this document uses the mean number of facilities (Table I.B.1.d-1).

An important determinant of the economic feasibility of producing OCS oil and gas is the cost of exploration, development, and production. These costs can vary widely within and between OCS provinces. The situation is further complicated by a number of factors which potentially affect costs: the type or combination of hydrocarbons present, the relationship between production decline rates and costs, location considerations (e.g., climate and water depth), and the type of recovery and transportation technology used. For a detailed analysis of OCS cost factors see Mansvelt Beck and Wiig (1977).

With these factors in mind, Table I.B.1.d-3 is illustrative of the possible investment level anticipated resulting from proposed Sale No. 68. This table gives the investment amounts estimated for the mean resource level. Manpower requirements were estimated for exploration, development, and production activities. Employment is expected to peak in 1985 during the exploratory drilling phases. Table I.B.1.d-4 shows estimated direct employment required to explore and develop the Sale No. 68 tracts. Transient labor is not included in this chart. These employment figures were used to develop indirect impacts on the region's employment.

TABLE I.B.1.d-2

DEVELOPMENTAL ASSUMPTIONS OVER PROJECT LIFE
(Based on Conditional Mean)

ea	Pipeline Offshore Miles	Pipeline Onshore Miles	Pipeline Burial Sediment (Cu. Yd.)	Drill Cuttings (000 BBLs.)	Drill Muds (000 BBLs.)	Formation Water (Mil.BBL.)	Sewage (Gal/Day)
nta Barbara annel	28	0	0	182,951	117,105	67	1,000-200
ner Banks d Basins	68	2	19,000	64,723	34,842	70	1,000-200
ter Banks d Basins	0	0	0	145,848	68,471	93	2,000-400
TAL	96	2	19,000	393,522	220,418	230	4,000-800

TABLE I.B.1.d-3

ESTIMATED INVESTMENT - SALE NO. 68
($ MILLIONS)
BASED ON CONDITIONAL MEAN RESOURCE ESTIMATE

Area	Exploration Delineation Wells	Development Wells	Platform & Production Equipment	Pipeline Laying
Santa Barbara Channel	416.0	67.6	241.0	36.4
Inner Banks	77.5	51.1	301.3	88.4
Outer Banks	94.5	162.0	602.5	0

Source: U.S. Geological Survey and Bureau of Land Management

TABLE I.B.1.d-4

ESTIMATED DIRECT EMPLOYMENT - SALE NO. 68
RESIDENT LABOR ONLY
BASED ON CONDITIONAL MEAN RESOURCE ESTIMATES

Year	Santa Barbara Channel Tracts	Inner Banks Tracts	Outer Banks Tracts
1981	0	0	0
1982	40	7	8
1983	183	26	37
1984	255	41	51
1985	262	56	54
1986	288	50	68
1987	195	103	95
1988	131	127	88
1989	102	60	125
1990	104	20	158
1991	63	20	136
1992	20	20	133
1993	20	20	40
1994	20	20	40
1995	20	20	40
1996	20	20	40
1997	20	20	40
1998	20	20	40
1999	20	20	40
2000	20	20	40
2001	20	20	40
2002	20	20	40
2003	20	20	40
2004	20	20	40
2005	20	20	40
2006	20	20	40

2. Administrative Events Leading Up to Proposal: Under the Outer Continental Shelf (OCS) Lands Act of August 7, 1953, (43 U.S.C. 1331-1343), as amended (92 Stat. 629), and the regulations issued thereunder (43 CFR 3300), the Department of the Interior is responsible for administering the mineral development of the Outer Continental Shelf. In the case of oil and gas development, the process involves several steps. These are as follows: 1) OCS Planning Schedule; 2) Request for Resource Reports; 3) Call for Nominations and Comments; 4) Tentative Tract Selection; 5) Scoping Meetings; 6) Draft Environmental Impact Statement and subsequent Public Hearings; 7) Endangered Species Consultation; 8) Final Environmental Impact Statement and Secretarial Issue Document; 9) Coordination with State(s); 10) Notice of Sale; 11) Sale; 12) Activity after a Sale; 13) Environmental monitoring.

The specifics of each step as they relate and will relate to proposed Lease Sale No. 68 are as follows:

a. OCS Planning Schedule: Section 208 of the Outer Continental Shelf Lands Act Amendments of 1978 (43 U.S.C. 1331 et. seq.) provides for new subsection 18 which requires that the Department of the Interior prepare "...an oil and gas leasing program...(which) shall consist of a schedule of proposed lease sales indicating...the size, timing, and location of leasing activity which...will best meet national energy needs for the 5-year period..." In June 1979, a proposed leasing program, which built upon the existing schedule, was formally submitted to Congress. At that time, it was also submitted to Governors of affected coastal States, the U.S. Attorney General, and published in the Federal Register. A Final Environmental Impact Statement (FEIS) was prepared on the 5-year schedule and was available to the public in January 1980. A final 5-year planning schedule (June 1980 through June 1985) was announced in June 1980.

b. Request for Resource Reports: On May 29, 1979, the Bureau of Land Management issued a Call for Resource Reports for the Pacific OCS area extending from the Point Conception on the north to the Mexican Border on the south and seaward to approximately 200 miles. Requests were submitted to 34 Federal and State agencies and eight interested individuals. Information was sought regarding other valuable resources and uses of the area, possible impacts of mineral operations upon these resources, and use conflicts with potential oil and gas development. Recommendations concerning the resolution of any conflicts between the activities of these agencies and oil and gas leasing/development in the OCS area were also requested.

c. Call for Nominations and Comments: On December 28, 1979, the Bureau of Land Management (BLM), pursuant to the authority prescribed in 43 CFR 3301.3 (1976), issued a Call for Nominations and Comments (Federal Register, Vol. 44, No. 250). The Call asked that specific areas on the Southern California OCS be identified relative to possible oil and gas leasing under the OCS Lands Act. The area under consideration for the proposed sale totaled approximately 2,900 blocks and covered an estimated 6,600,000 hectares (16,300,000 acres). The petroleum industry was asked to designate specific tracts on which it would like to bid if a Sale were held. The request also asked Federal, State, and local governments, other industries, universities, research institutions, environmental organizations, and the public to identify specific tracts they believe should be excluded from oil and gas leasing, or leased only under certain restrictions because of conflicting resource values or environmental factors.

In response to the Call for Nominations and Comments, on March 31, 1980 BLM announced that 10 oil companies nominated 609 blocks totaling 1,295,546 hectares (3,200,000-acres). In addition to the industry nominations, 94 comments were received from Federal, State, and local government units as well as environmental groups and private citizens expressing either concern about offshore leasing, in general, or recommending specific tracts be deleted.

d. Tentative Tract Selection: On May 30, 1980, the Department of the Interior announced selection of 221 tracts comprising 457,479 hectares (1,130,415 acres) for intensive environmental study for proposed OCS Sale No. 68 (see Visual No. 1). Although 221 tracts were included in the tentative tract selection, tracts originally numbered 69, 76, and 77 will not be considered as a part of the proposal. These tracts are now in the Santa Rosa Unit Area as approved by the U.S. Geological Survey in July, 1980. They represent a 6,912 hectare (17,280 acres) reduction in the Sale area as originally proposed. Preliminary tract selection meetings were held in Los Angeles and Washington D.C. They included representatives of the California Governor's Office of Planning and Research, California State Lands Commission, California Coastal Commission, County of Santa Barbara, City of Los Angeles, and Federal agencies.

e. Scoping Meetings: In accordance with the Council on Environmental Quality's National Environmental Policy Act Regulations (Sec. 1501.7), which require that there be "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action," BLM-POCS conducted a series of nine EIS scoping meetings in Southern California.

Meetings were held in each of the following cities on the dates and times shown.

1), 2) Newport Beach August 4, 1980

8:00 am - 12:00 noon
1:00 pm - 4:00 pm

3), 4) San Pedro August 5, 1980

8:00 am - 12:00 noon
1:00 pm - 4:00 pm

5), 6) Ventura August 11, 1980

1:00 pm - 4:00 pm
7:00 pm - 10:00 pm

7), 8) Santa Barbara August 12, 1980

8:00 am - 12:00 noon
1:00 pm - 4:00 pm

9) Los Angeles September 15, 1980

9:30 am - 11:30 am
(for Pacific States Regional Technical Working Group)

At each location, except Los Angeles, the first meeting was aimed at Federal, State, and local government agencies/representatives and special interest groups. The latter represented, for example, by the Western Oil and Gas Association and Get Oil Out. The second meeting was intended for the general public.

The scoping meetings emphasized seven points relative to OCS leasing and the proposed sale: 1) an overview of the leasing process, 2) history, 3) legal authority, 4) purpose and goal of scoping, 5) EIS format and structure, 6) 15 major issues, and 7) alternatives to the proposed action. After presentations on the above topics were completed, the attendees were encouraged to comment and participate with staff specialists in discussions. Franked, self-addressed envelopes were provided for anyone wishing to make future comments.

Prior to holding these meetings an invitational letter, agenda, and locational listings were sent to 442 locations in Southern California. The locations included the following:

Media outlets	92
City officials/agencies	89
Elected/appointed officials	45
Oil and gas industry	51
State agencies	27
Federal agencies	30
Academic institutions	16
Special interest groups	38
Association of governments	2
Southern California businesses	35
Southern California counties/ Officers	34

In spite of this extensive notification process, the attendance at the scoping meetings was very low, ranging from two (2) attendees to a maximum of twenty-eight (28) at Santa Barbara.

No new alternatives to the proposal were recommended. Major issues discussed at the various locations are shown in Table I.B.2.e-1.

TABLE I.B.2.e-1

MAJOR ISSUES

Meeting Location		Primary Potential Issues, Impacts, Conflicts
Newport Beach	1)	Prehistoric archaeological sites on the OCS
	2)	Submarine transit lanes
	3)	Pacific Missile Test Range
	4)	Near shore marine mammals
	5)	Intertidal marine life
	6)	Excess pessimism of BLM oil spill model
San Pedro	1)	Land use in Huntington Beach by oil and gas operators
	2)	Collision potential, off Port of Long Beach, between platforms and ships
	3)	Liability for damage to Port of Long Beach
	4)	Marine life
Ventura	1)	Marine life
	2)	Shipwrecks and aboriginal sites on the OCS
Santa Barbara	1)	Cumulative impacts of previous sales
	2)	Increased quantities of oil on beaches
	3)	Studies to determine cause of increased oil on beaches
	4)	Marine life
	5)	Commercial fishing conflicts, particularly debris, obstructions on sea bed
	6)	Air quality
	7)	Marine sanctuary
	8)	Pipeline corridors and seismicity
	9)	Inaccurate baseline data on air quality, surface currents, rig monitoring
	10)	Lack of previous contracts awarded to Santa Barbara residents

The September 15, 1980 scoping meeting was held for the Pacific States Regional Technical Working Group. The Group made five official remarks/recommendations.

1. There should be a discussion of the proposed Sale No. 68 tracts which were included in the environmental assessment process for past Sales and were withdrawn prior to the Sale. The tracts previously withdrawn should be listed and accompanied by a discussion of why each was withdrawn and why each is being reconsidered at this time. A map showing these tracts should be included with the discussion.

2. A cost/benefit - risk/benefit analysis of the proposed action and alternatives should be performed.

3. A local impact analysis using improved socio-economic models should be used in determination of impacts. Information regarding socio-economic impacts should be collected, analyzed, and presented at both county and subcounty levels.

4. The National and State energy needs should be discussed relative to the contribution of Lease Sale No. 68 and ongoing energy activity in the region.

5. There should be a discussion of the cumulative effects of leasing (Federal OCS and State Tidelands) in the Southern California Bight and associated areas to include environmental and socio-economic impacts. The competition for space in the Santa Barbara Channel between commercial vessels, platforms, fishing interests, etc., should be analyzed.

Whenever possible, all the above concerns were examined and are discussed in the DEIS. It should be noted that scoping is an ongoing process. Additional comments are invited and will be carefully considered throughout the preparation of the final EISs.

f. Draft Environmental Impact Statement (DEIS) and Subsequent Public Hearings: Pursuant to section 102(2)(c) of the National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347), the Department of the Interior's Bureau of Land Management announced on May 4, 1979 (Federal Register, Vol. 44, No. 88) that it intended to prepare an EIS for the purpose of considering the effects of proposed OCS Sale No. 68 offshore Southern California. The DEIS considers all available data and information available up to this time and evaluates potential effects of the action on the marine environment, air quality, recreation, archaeology, geology, and socio-economics in the area. The DEIS is made available for public review and public hearings are then held. The DEIS is then updated to a Final Environmental Impact Statement.

g. Endangered Species Consultation: As required by the Endangered Species Act of 1973, as amended, BLM and USGS are consulting with FWS and NMFS to ensure that the leasing and exploration phases of Sale No. 68 are not likely to jeopardize the continued existence of endangered or threatened species, or destroy or adversely modify the critical habitat of such species. The biological opinions to be provided by FWS and NMFS will be included in the FEIS. Consultation will be continued until any issues are resolved. USGS will reinitiate consultation, as needed, if any development and production activities result from the Sale.

h. Final Environmental Impact Statement (FEIS): The FEIS will reflect Department of the Interior consideration of all comments received, including those from the public and Federal, State, and local officials. The Final Impact Statement is filed with the Environmental Protection Agency (EPA) and a 30-day waiting period must follow before any decision is possible. None of the steps outlined above constitutes a decision to hold a Sale. All are required as part of the process for compliance with NEPA, and are spelled out in regulations issued by CEQ and the Department of the Interior. At this stage, the decision is usually tentative. Normally, no decision is entertained until the Proposed Notice of Sale (released at the same time) is commented upon by the States. This period usually runs at least 60 days following FEIS release. Further coordination follows.

i. Coordination with State: Section 208, subsection 19, of the OCS Lands Act Amendments of 1978 provides for coordination and consultation with affected State and local governments. If the Secretary of the Interior makes a preliminary decision to hold a Sale, the Governor of the affected State has 60 days in which to make recommendations. Thereafter, the Secretary of the Interior will respond to the "...Governor's recommendations, or...implement any alternative means identified in consultation with the Governor to provide for a reasonable balance between the national interest and the well-being of the citizens of the affected State."

j. Notice of Sale: If a final decision to hold the Sale is then made by the Secretary of the Interior, he will specify what tracts shall be offered and what terms and conditions are to be imposed on lease purchasers. The Sale Notice will be published in the Federal Register. Under the pending OCS planning schedule, the Notice of Sale for proposed OCS Sale No. 68 would be issued in April 1982.

k. Sale: Outer Continental Shelf oil and gas lease sales are open to the public. Under the pending OCS planning schedule, the proposed OCS sale is scheduled for May 1982.

l. Activity After a Sale: Continued formal and informal contacts with the State for future planning and discussion of onshore facilities, such as pipeline corridors, are conducted, as well as coordination under Department of the Interior Manual 655. The U.S. Geological Survey assumes operational responsibility for the activity which follows.

m. Environmental Monitoring: BLM will consider environmental monitoring studies for the areas leased as a result of a Sale. Each area would be evaluated on a case-by-case basis to design an effective monitoring program responsive to management questions. Special monitoring studies may be required for areas identified as having a special resource value. Appropriate State officials are contacted on a continuing basis in a consulting capacity. BLM will provide for a free flow of information to keep the State informed of the status of any monitoring program. The State will be informed through the OCS Advisory Board, through State liaison officers, and through the activities of the Pacific Outer Continental Shelf Office.

3. Regulatory Framework

a. Legal Mandates and Authority

OCS Lands Act. The Outer Continental Shelf Lands Act of 1953 (67 Stat. 462), as amended in 1978 (P.L. 95-372; 92 Stat. 629), established Federal jurisdiction over submerged lands on the Outer Continental Shelf (OCS) seaward of State boundaries (generally 3 geographic miles seaward of the coastline). Under the OCS Lands Act, the Secretary of the Interior is responsible for the administration of mineral exploration and development of the OCS. The Act empowers the Secretary to grant leases to the highest qualified responsible bidder(s) on the basis of sealed competitive bids and to formulate such regulations as necessary to carry out the provisions of the Act.

The Act, as amended, provides guidelines for implementing an OCS oil and gas exploration and development program. The basic goal of the Act is to expedite exploration and development of the OCS minerals in order to achieve national economic and energy policy goals, assure national security, reduce dependence on foreign sources of oil, and maintain a favorable balance of payments in the world trade. With respect to implementing a leasing program, this goal is constrained by the following considerations: (1) the receipt of fair and equitable return on oil and gas resources; (2) preservation and maintenance of competition; and (3) balancing orderly energy resource development with protection of the human, marine, and coastal environments.

The Secretary of the Interior has designated the Bureau of Land Management as the administrative agency responsible for the leasing of submerged Federal lands, and the Geological Survey (USGS) for the supervision of offshore operations after lease issuance. Regulations administered by the Bureau of Land Management govern the leasing of mineral deposits on the OCS and the granting of rights-of-way for pipelines (43 Code of Federal Regulations, Part 3300). Regulations administered by the Geological Survey govern the conduct of mineral operations which are contained in 30 CFR Part 250, and are supplemented by OCS operating orders on an area-specific basis.

Major requirements of the Act and its implementing regulations, many of which mitigate some of the possible adverse impacts resulting from OCS leasing and development, follow:

- In the enforcement of the safety, environmental, and conservation laws and regulations, the Secretary shall cooperate with the relevant departments and agencies of the Federal Government and of the affected States.
- The Secretary is authorized to suspend or temporarily prohibit an operation or activity pursuant to a lease or permit.
- The Secretary is authorized to cancel a lease or permit.
- The Secretary is authorized to issue regulations for unitization, pooling, and drilling agreements.
- The Secretary is authorized to issue regulations to prevent OCS operations from adversely affecting the national ambient air quality standards.

- The Secretary may cancel a nonproducing lease for the owner's failure to comply with any of the provisions of the act, the lease, or regulations under the act.

- The Secretary may initiate judicial proceeding to cancel a producing lease because of the owner's failure to comply with any of the provisions of the act, the lease, or regulations under the act.

- Rights-of-way may be approved under such regulations and upon such conditions as may be prescribed by the Secretary, assuring maximum environmental protection by utilization of the best available and safest technologies.

- Exploration must be undertaken pursuant to an approved exploration plan. No permit for drilling may be issued until all affected States with approved coastal zone management programs have concurred or been presumed to concur with the consistency determination provided by the lessee.

- Geological explorations on unleased areas of the OCS shall be allowed only if such exploration will not be unduly harmful to aquatic life in the area, result in pollution, create hazardous or unsafe conditions, unreasonably interfere with other uses of the area, or disturb any site, structure, or object of historical or archaeological significance.

- Governors of affected States may submit recommendations to the Secretary regarding the size, timing, or location of a proposed lease sale, or with respect to a proposed development and production plan.

- The Secretary is authorized to enter into cooperative agreements with affected States for several purposes, including but not limited to sharing of information, joint utilization of available expertise, joint planning, review, and permitting procedures, and the formation of joint surveillance and monitoring arrangements relevant to OCS operations, both onshore and offshore.

- The Secretary shall conduct a study of any area or region included in any oil and gas sale in order to establish information needed for assessment and management of environmental impacts on the human, marine, and coastal environments of the OCS and the coastal area which may be affected by oil and gas development in such area or region.

- Subsequent to the leasing and development of any area or region, the Secretary shall conduct additional studies to establish environmental information and shall monitor the human, marine, and coastal environments of such area or region.

- The Secretary shall consider relevant environmental information in making decisions, in developing appropriate regulations and lease conditions, and in issuing operating orders.

- In exercising their respective responsibilities, the Secretary and the Coast Guard shall require, on all new drilling and production operations and, wherever practicable, on existing operations, the use of the best available and safest technologies (BAST)[a]. The Secretary determines the economic feasibility of utilizing the BAST. Wherever failure of equipment would have a significant effect on safety, health, or the environment the Secretary shall require use of BAST, unless he determines that the incremental benefits are clearly insufficient to justify the incremental costs of utilizing such technologies.

- The holder of a lease or permit shall maintain all operations within such lease area or within the area covered by such permit in compliance with regulations intended to protect persons, property, and the environment on the OCS.

- The Secretary of the Interior, the Secretary of the Department in which the Coast Guard is operating, and the Secretary of the Army shall enforce safety and environmental regulations promulgated under the Act. The Secretary and the Coast Guard shall promulgate regulations for on site inspections of OCS facilities.

- Any person having a valid legal interest which is or may be adversely affected may commence a civil action to compel compliance with the OCS Lands Act against any person, including the United States, for any alleged violation of any provision of the OCS Lands Act, or regulation promulgaged thereunder, or terms of any permit or lease issued under the OCS Lands Act.

- The Attorney General or a U.S. Attorney may institute a civil action for a temporary restraining order, injunction, or other appropriate remedy to enforce any provisions of the OCS Lands Act, regulation or order issued under the Act or any terms of a lease, license, or permit issued under the Act.

- Prior to development and production of an oil and gas lease, the lessee shall submit a development and production plan to the Secretary for approval.

- The Secretary shall disapprove a development and production plan if:

    a. the lessee fails to demonstrate he can comply with requirements of the OCS Lands Act or other applicable Federal law;

    b. activities described do not receive a consistency concurrence by a State with an approved CZM plan;

    c. operations threaten national security or defense; or

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[a] Please see the following: The Use of Best Available and Safest Technologies (BAST) During Oil and Gas Drilling and Producing Operations of the Outer Continental Shelf (OCS). Single copies available from: Office of Deputy Division Chief for Offshore Mineral Regulation, USGS, Mail Stop 640, Reston, VA 22092.

d. (1) exceptional geologic conditions, exceptional values in the marine or coastal environment or other exceptional conditions exist, and that implementation of the plan would probably cause serious harm or damage to life, to property, to any mineral deposits,....or to the marine, coastal, or human environments; (2) the threat of harm or damage will not disappear or decrease to an acceptable extent within a reasonable period of time; and (3) the advantages of disapproving a plan outweigh the advantages of development and production.

- The Secretary shall not grant a license or permit for any activity in an exploration, development or production plan affecting any land or water use in the coastal zone of a State with an approved Coastal Zone Management plan, unless the State concurs or can be presumed to concur with the consistency certification accompanying such plan.

- The Secretary shall, from time to time, review each development and production plan. If the review indicates that the plan should be revised to meet the requirements of Section 25 of the OCS Lands Act, the Secretary shall require such revision.

- The Secretary shall provide affected States with information to assist them in planning for the onshore impacts of possible oil and gas development and production.

- The Secretary of the Department of Transportation shall administer the Offshore Oil Spill Pollution Fund establishing compensation for injuries caused by oil discharge from an offshore facility or vessel. (See Section I.B.7 below).

- The Secretary of the Department of Commerce shall administer the Fishermen's Contingency Fund which provides compensation for damage to fishermen's gear or vessels resulting from oil and gas exploration, development, and production. (See Section I.B.7 below).

Federal/State Coordination. The OCS Lands Act, as amended, provides a statutory foundation for the Department's policy of coordination of OCS activities with affected States and, to a more limited extent, local governments. At each step of the procedures that lead to lease issuance, participation from affected States and other interested parties is encouraged and sought. Below is a detailed discussion of coordination mechanisms required by the OCS Lands Act.

The Secretary of the Interior is required to invite and consider suggestions from the Governor of any affected States during preparation of any proposed leasing program prior to its publication in the *Federal Register*. The Secretary is required to provide a written response to any request from a Governor for modification of a proposed leasing program. State and local governments may comment directly on a proposed leasing program in its published form. The Secretary is obligated to establish procedures for review of proposed leasing and periodic consultation with State and local governments (Section 18).

Within 60 days after notice of a proposed lease sale or receipt of a development and production plan, the Governor of any affected State may make recommendations to the Secretary with regard to the size, timing, or location of the proposed lease sale or development and production plan. If the Secretary determines that any such recommendations provide for a reasonable balance between the well-being of the citizens of the affected State and the national interest, he must accept them. The Secretary must also respond to the Governor in writing, giving his reasons for accepting, rejecting, or modifying the Governor's recommendations. The Secretary may enter into cooperative agreements with affected States, for purposes consistent with the Act and other applicable Federal law (Section 19).

When soliciting nominations for the leasing of lands within 3 miles of the seaward boundary of any coastal State, additional information is to be provided to the Governor of those States. The Governor must be informed of the identity of and schedule for the area proposed for leasing; the geographical, geological and ecological characteristics of the area within 3 miles of the seaward boundary; an estimate of oil and gas reserves in these areas; and any field, trap, or geologic structures thought to be located in these areas. After the close of the call period, the Governor is informed of any area which merits further consideration for leasing (Section 8(g)).

Under Section 25 of the Act, the Secretary must submit copies of development and production plans to the Governor of any affected State for review. The State then has 60 days to provide comments and recommendations to the Secretary. Section 11 of the Act and the regulations contained in 30 CFR 250.34 also require that any exploration plans submitted to the Secretary must be approved or disapproved within 30 days. Written comments from the Governor of any affected State will be considered prior to approval action if they are timely.

Under Section 26 of the Act, the Secretary must make available to affected States a summary of data to aid them in anticipating possible onshore effects of OCS development and production. The summary includes estimates of oil and gas reserves in areas leased or to be leased, estimated size and timing of development, pipeline location, and the general location and nature of onshore facilities.

The Act also requires preparation and transmittal to each affected State of an index of all relevant actual or proposed programs, plans, reports, environmental impact statements, tract nominations, and other lease sale information. On request, the Secretary must send copies of these documents to the affected State.

b. Authorities of Federal Regulatory Agencies

Department of the Interior. The Bureau of Land Management and U.S. Geological Survey are Department of the Interior agencies with direct OCS regulatory and enforcement authority. BLM implements the OCS leasing regulations under 43 CFR Part 3300 and cooperates with USGS and other Federal agencies to develop special stipulations that apply to either specific leases or all leases within the proposed lease areas. These stipulations address such matters as cultural and biological resources, pipeline rights-of-way, disposition of drilling wastes, and equipment identification. In addition to issuing leases, BLM issues rights-of-way for pipelines on the OCS which are not wholly contained within the boundaries of a single lease, the boundaries of unitized leases, or the boundarie of continguous leases of the same owner or operator.

USGS administers regulations governing lease operations, including exploration and development of the OCS under 30 CFR Part 250. These regulations are the basis for OCS Orders which apply to operations in the proposed lease area. See Section I.B.5 for a discussion of USGS Orders for the proposed lease area. Additionally, USGS maintains jurisdiction over producer-owned gathering lines and flowlines on the OCS (these are lines restricted to a leasehold or unit).

The Department of the Interior has promulgated regulations describing a program for regulating air pollution from OCS operations. The final regulations which became effective as of June 2, 1980, were published in the Federal Register on March 7, 1980 and will be codified as 30 CFR 250.57.

The U.S. Fish and Wildlife Service (USFWS) shares responsibilities with other agencies for protection of fish and wildlife resources and their habitats, and acts in an advisory capacity in the formulation of OCS leasing stipulations. It also provides recommendations to the Corps of Engineers in the issuance of Federal permits to industry for construction in navigable waters. USFWS is also responsible for the protection and stewardship of certain species covered under the Endangered Species Act of 1973, as amended.

U.S. Army Corps of Engineers. The OCS Lands Act provides authority to the Secretary of the Army to prevent obstruction to navigation in U.S. navigable waters and to prevent obstructions caused by structures located on the OCS. Section 10 of the Rivers and Harbor Act of 1899 (30 Stat. 1151) requires that permits be issued for all offshore construction, including pipelines, in U.S. navigable waters.

Permits must also be issued for onshore facilities in which dredging and filling of U.S. navigable waters are involved. Structure permits for exploratory drilling vessels and for fixed and mobile platforms are issued by the Corps. Permits for structures in State waters must consider environmental requirements before the issuance pursuant to Section 404 of the Clean Water Act. Section 404 also delegates regulatory authority to the Secretary of the Army over discharge of dredged or fill material in wetlands.

Department of Transportation. The OCS Lands Act grants authority to the Coast Guard to promulgate and enforce regulations covering lighting and warning devices, safety equipment, and other safety-related matters pertaining to life and property on fixed OCS platforms and drilling vessels. Through the Coast Guard, the Department of Transportation (DOT) advises the Corps of Engineers on the issuance of permits and the placement of offshore structures. Under the Port and Tanker Safety Act of 1978, the Coast Guard has the authority to establish shipping safety fairways and other ship routing systems in which OCS structures may be prohibited. The Coast Guard also has jurisdiction to enforce the Clean Water Act on the OCS.

Under the Clean Water Act, the U.S. Coast Guard approves the procedures to be followed and the equipment used for the transfer of oil from vessel to vessel and between onshore and offshore facilities and vessels. The Coast Guard also conducts pollution surveillance patrols to detect oil discharges within territorial and contiguous waters and has enforcement authority over violations. The Coast Guard also has strike team responsibilities should an oil spill occur.

The Materials Transportation Bureau (MTB) is responsible for establishing and enforcing design, construction, operation, and maintenance regulations for pipelines. The Department of Transportation's responsibility and authority is further defined in a Memorandum of Understanding between it and the Department of the Interior.

Department of Commerce. The Department of Commerce, through the National Oceanic and Atmospheric Administration (NOAA) and the National Marine Fisheries Service (NMFS), is responsible for protection of marine fishery resources and their habitats, and for providing recommendations to the Corps of Engineers regarding the issuance of permits in navigable waters. NOAA participates in making recommendations to the BLM pertaining to OCS leasing and development through a Basic Agreement for Program Coordination. BLM participates in a number of NOAA activities under the same Basic Agreement.

The Department's responsibility and authorities related to OCS development include the Fishery Conservation and Management Act of 1976, the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, the Fur Seal Act of 1966, Title II of the Marine Protection, Research, and Sanctuaries Act of 1972 ("Comprehensive Research on Ocean Dumping"), and the National Ocean Pollution Research and Development and Monitoring Act of 1978.

The Department of Commerce also administers the Coastal Zone Management Act (CZMA) of 1972, as amended (16 USC 1451-1464), through the National Oceanic and Atmospheric Administration. The CZMA encourages the development and implementation of coastal management programs for the sound management of State coastal resources by providing a system of grants, loans, and loan guarantees to the States. Once developed, the program is then submitted to the Secretary of Commerce for approval after which the Coastal Management Program (CMP) may be implemented. California has an approved CMP which is currently being implemented (see Section I.8.a).

Section 307 of the CZMA contains the Federal consistency provision which imposes certain requirements on Federal agencies to comply with approved State coastal zone management programs.

Section 307(c)(1) requires Federal agencies conducting or supporting activities directly affecting the coastal zone be consistent to the maximum extent practicable with a State's coastal program. NOAA's Federal consistency regulations (15 CFR 930.30-.44) require Federal agencies to review each activity to assess whether it would "directly affect" the coastal zone of a State with an approved CZM program. If the Federal activity would have direct effects, the Federal agency must prepare a consistency determination and submit it to the State. If the Federal activity would have no direct effects, the Federal agency is to make a negative determination.

In States with an approved CMP, Federal agencies are prohibited (Section 307Oco 03oOAo) from issuing licenses/permits for any activity in the coastal zone that might affect land or water uses, unless the proposed activity is consistent with the CMP. In cases of inconsistency, the Secretary of Commerce may override the State's objection.

Section 307(c)(3)(B) requires that no Federal license or permit for an activity described in detail in an OCS exploration plan or development and production plan which affects a land or water use in the coastal zone of a State with an approved CMP may be approved until the State has concurred with the consistency determination made by the lessee or the Secretary of Commerce has overridden the State's objections.

Finally, under Section 307(d), Federal agencies may not provide Federal assistance for proposed projects that are inconsistent with a State's coastal management program except upon certain findings by the Secretary of Commerce.

Department of Energy. With respect to Outer Continental Shelf leasing, and in consultation with the Secretary of the Interior, the Department of Energy (DOE) is authorized under the Department of Energy Organization Act (91 Stat. 565) (1977) to foster increased competition for leases, to implement authorized systems of bidding, to establish due diligence requirements for OCS operations, to set rates of production, and to determine amounts of OCS gas purchased and transported. DOE has broad authority over approval, design, and economies of common carrier gas pipelines.

In addition, the Department of Energy provides support to the Leasing Liaison Committee, whose function is to coordinate leasing policies of the Department of the Interior with DOI policies.

The Federal Energy Regulatory Commission (FERC), within DOE, has the authority under the Natural Gas Act to issue certificates of public convenience and necessity for proposed projects involving the transportation or sale of natural gas in interstate commerce. All natural gas produced from the OCS is considered to be interstate and therefore, is subject to FERC jurisdiction. The Natural Gas Act, the National Environmental Policy Act, and OCS Lands Act Amendments of 1978 all grant authority for or require that the FERC investigate the environmental effects of a proposed offshore project, as well as the potential gas reserves, the need for this gas, and the availability of capital to develop this resource. Also, the FERC is primarily responsible for administering and enforcing the Natural Gas Policy Act (NGPA) of 1978 (92 Stat. 3350). As applied to OCS matters, the NGPA provides new wellhead pricing controls for certain natural gas produced from the OCS.

Environmental Protection Agency. Under the Federal Water Pollution Control Act (FWPCA) Amendments of 1972, (86 Stat. 816), a National Pollution Discharge Elimination System (NPDES) was created and applies to discharges into the territorial seas, waters of the contiguous zone, and the oceans. The NPDES applies to fixed platforms and drillships, and any discharges from these sources would require a permit issued by the Environmental Protection Agency (EPA). Discharges of pollutants without the necessary permits from EPA are unlawful. Such an NPDES permit does not apply to discharge of pollutants from any vessels or floating craft, or subsurface injection wells for production purposes. Subsurface injection is subject to USGS regulations and operating orders.

The Clean Water Act (91 Stat. 1566) (1977), which amended the FWPCA, also applies to offshore operations and provides that lessees or operators may be held financially liable for damages due to oil spills. It provides for a liability up to $50 million for actual costs of oil removal and cleanup as well as replacement or restoration costs of natural resources damaged or destroyed by a spill.

EPA is also primarily responsible for facilities not related to transportation, such as terminal and storage facilities. Permits for any discharges would be issued by EPA or designated States according to established effluent guidelines. Provisions of the Clean Water Act also apply to onshore OCS-related facilities.

Interstate Commerce Commission. The Interstate Commerce Commission grants approval of the tariff rates for transportation of oil by common-carrier pipelines.

Relationship of the Proposed Sale to the Overall OCS Leasing Program. Section 18(a) of the OCS Lands Act, as amended, provides that "The Secretary...shall prepare and periodically revise, and maintain an oil and gas leasing program...". In compliance with the Act, the Secretary of the Interior submits a proposed leasing program to the Congress, the Attorney General, and the Governors of affected States. The leasing program consists of a schedule of proposed lease sales indicating, as precisely as possible, the size, timing, and location of leasing activity which will best meet national energy needs for the 5-year period following its approval or reapproval. The goal of the leasing program is to provide for orderly development of OCS oil and gas resources and to maintain an adequate contribution of OCS production to the national supply in order to reduce dependence on foreign oil.

The United States has three overriding energy objectives outlined in the National Energy Plan:

- as an immediate objective that will become even more important in the future, reduce dependence on foreign oil and vulnerability to supply interruptions;

- in the medium term, to keep U.S. imports sufficiently low to weather the period when world oil production approaches its capacity limitation; and
- in the long term, to have renewable and essentially inexhaustible sources of energy for sustained economic growth.

Full development of OCS resources is an integral part of that plan (the National Energy Plan, Executive Office of the President, Energy Policy and Planning, 1977).

The final decision on the 5-year OCS Oil and Gas Lease Schedule was issued in June 1980.

The 5-year OCS leasing program does not represent a decision to lease in a particular area. It represents only the Department's intent to consider leasing certain areas, and to proceed with the leasing of such areas if it should be determined that leasing and development in such areas would be environmentally acceptable and technically feasible.

c. Intergovernmental Planning Program

Intergovernmental Planning Program. In 1979, the Bureau of Land Management established a new planning and coordination program for OCS leasing and development. The program is designed to provide input into three major BLM OCS program elements: 1) OCS leasing process, 2) OCS environmental studies program, and 3) transportation of OCS hydrocarbons. This program does not replace or affect existing authorities, coordination procedures or responsibilities of the BLM.

The Intergovernmental Planning Program for OCS Leasing, Transportation and Related Facilities (IPP) functions through six regional technical advisory committees of the National OCS Advisory Board. These committees, Regional Technical Working Groups (RTWGs), are comprised of individuals who represent Federal and State interests as well as industry and other special and private interests. The Pacific States Regional Technical Working Group, in which the States of California, Oregon, and Washington are represented, meets approximately four times a year. The members have discussed a number of issues pertaining to existing leases, future leasing activity, transportation of hydrocarbons off the OCS, production and transportation technology for deep water, ongoing and proposed environmental studies for the region. The Pacific RTWG has provided issues for Tract Selection and for the EIS for Sale No. 68. It is anticipated that recommendations to the Manager, Pacific OCS Office, will be developed by the RTWG regarding issues for the Sale No. 68 Secretarial Issues Document and lease stipulations, as necessary. Once a Sale has been held, the RTWG will address transportation and other post-sale activities in the Sale area.

The Pacific RTWG is currently studying transportation siting considerations in two areas offshore Southern California: The Santa Barbara Channel and offshore San Pedro Bay. Existing geophysical, environmental, and industry infrastructure information has been mapped and described as part of the EIS and transportation efforts. It is anticipated that the RTWG will be able to identify factors critical to pipeline siting and other transportation modes and recommend measures to mitigate possible adverse effects of selected transportation modes in specific areas.

4. Environmental Studies: In 1973, BLM initiated an environmental studies program for the OCS to obtain marine and coastal environmental data relative to offshore resource development impacts. Since FY 1975, the annual Congressional Appropriations Bill for BLM has included funds for BLM's environmental studies program. The 1978 amendments to the OCS Lands Act provided the first legislative mandate for studies in support of OCS minerals development. Section 20 of this act requires the Secretary of the Interior to commence environmental studies at least 6 months prior to a lease sale in a frontier area. The ultimate goal of BLM's OCS environmental studies program is:

> ..."to establish information needed for prediction, assessment, management of impacts on the human, marine, and coastal environments of the Outer Continental Shelf and the nearshore area which may be affected by oil and gas activities in such area or region."
> (43 CFR part 3331.1)

Early in 1978, BLM commissioned an *ad hoc* advisory committee to evaluate BLM's studies program and to prepare a *national* study design for future studies. The national study design is a framework to develop studies based on information needs required to answer specific management questions in the OCS leasing and development process. The new national study design was adopted by BLM and the Department of the Interior's OCS Advisory Board in 1978. The result of this program design in the Central and Northern California OCS area is an annual OCS Environmental Studies Plan prepared by BLM's Pacific OCS Office with coordination and review by other Federal and State agencies, local government, industry, and the general public. The *California OCS Environmental Studies Plan for Fiscal Years 1982 and 1983* is available from the Pacific OCS Office. Described in the plan are BLM's past environmental studies activity in the area since 1976, ongoing studies, current procurements for FY 1980, planned topics for FY 1981, and proposed BLM study topics for FY 1982 and 1983. Information on current projects and products available from past studies can be obtained from the Studies Staff Chief, Pacific OCS Office.

Table I.B.4-1 briefly lists the status of past and current BLM-funded studies in the Southern California area. BLM is also funding several studies in the Central and Northern California area and in other OCS areas whose results can apply to the Southern California OCS area.

BLM recognizes the information gaps that exist for the Southern California marine and coastal environment, as well as other OCS areas. The purpose of BLM's OCS studies program is to attempt to fill the significant information gaps for making OCS leasing and management decisions within the framework of the Department of Interior's OCS Leasing Schedule. BLM also recognizes that other agencies and organizations are studying the OCS and coastal environment and that the studies program should build on the results of other past and ongoing programs. Answering many questions over a wide range of issues for the dynamic marine and coastal environments is a lengthy and complex process. Some questions can be answered by relatively short-term studies, others only after a long-term effort, and still others may not be answered at all. BLM is planning and carrying out a long-term study effort in the California OCS and

TABLE I.B.4-1

PAST, CURRENT AND PROPOSED BLM OCS
STUDIES ACTIVITIES IN SOUTHERN CALIFORNIA

	Study Title	Contract Award Date	Progress Reports	Draft Final Due	Final Report Due
FY 1974	Southern California Literature Study	10/25/73			11/14/74
FY 1975	Southern California Public Meeting	11/15/74			3/12/75
	Southern California Marine Mammal and Seabird Survey, Year I	3/23/75			2/9/79
	Southern California Bight Baseline, Year I	6/30/75			11/78
	Geol. Reconn. of Tanner and Cortes Banks	5/75			12/75
FY 1976	Southern California Marine Mammals and Seabirds, Year II	4/1/76	Monthly reports		
	Southern California Bight Intertidal Baseline, Year II	7/1/76			2/9/79
FY 1977	Barium and Vanadium Methodology	2/1/77			11/12/77
	Southern California Bight Air Quality Modeling	4/25/77			2/13/78
	Southern California Bight Archaeological Lit. Survey	5/31/77			11/1/78
	Southern California Marine Mammal and Seabirds, Year III	6/21/77	Monthly reports		
	Southern California Bight Intertidal Baseline, Year III	7/1/77			9/21/79

TABLE I.B.4-1 (Cont.)

	Study Title	Contract Award Date	Progress Reports	Draft Final Due	Final Report Due
FY 1977 (Cont.)	Southern California Bight Benthic and Water Column Baseline, Year II	8/4/77			9/21/79
FY 1978	San Pedro Shelf Sediment Transport	2/10/78			12/79
	Southern California Shelf and Ridge Geophysics and Geo. Hazards	4/10/78			12/79
	Southern California Sale 48 Air Quality Assistance	9/22/78			5/4/79
	Tanner and Cortes Banks Reconn. and Characterization	9/1/78			2/80
FY 1979	Formation Water Dispersion Study	7/79			9/80
	Climatology and Oceanographic Analysis of the California Pacific OCS Region	11/1/78			3/81
FY 1980	Establishment and Operation of a West Coast OCS Meteorological Buoy Monitoring Network	6/80	Quarterly reports		
	California Seabird Oil Spill Behavior Study	9/29/80	Monthly reports		1/82
	California Commercial and Sports Fish Oil Toxicity Study	9/30/80			8/81
	Offshore Meteorological and Tracer Measurements	7/80			8/81
FY 1980 (Cont.)	Southern California Air Quality Model Validation Study	8/12/80			8/81
	Santa Barbara Prehistoric Mapping Study	9/25/80			12/80
	Sale No. 68 Air Quality Trajectory Model Study	9/17/80			1/81

coastal area. This study effort is assembling available environmental information which is used at the various OCS leasing and development decision points and also aids in enhancing the prediction and assessment of significant impacts from proposed OCS oil and gas activities.

5. OCS Operating Orders: OCS Orders are mandatory requirements and specifications for oil and gas exploration and recovery operations that supplement other regulations. Orders outline permit requirements, engineering criteria, surveillance, testing procedures, and information requirements. They are administered by the U.S. Geological Survey. Revisions were made to OCS Orders Nos. 1, 2, 3, 4, 5, 7, 8 and 12, effective January 1, 1980. The following is a brief description of each provision applicable to the Pacific Region.

OCS Order No. 1. This order requires identification of the operator, block designation and well number on platforms, structures, wells and mobile drilling units. It requires that the U.S. Coast Guard District Commander determine what aid-to-navigation devices are needed for subsea objects that are hazards to navigation or to the deployment of commercial fishing devices. It requires that equipment of sufficient size or of such a nature that it could be expected to interfere with commercial fishing gear, if dropped overboard, be marked, wherever practicable, with the owner's identification.

OCS Order No. 2. This order details drilling operation rules and permit requirements, including those for mobile drilling units (including fitness and ability to withstand oceanographic and meteorologic conditions). It includes criteria relative to well casing and cementing; blowout-preventer equipment; mud program; supervision, surveillance and training; and for the establishment of field drilling rules.

OCS Order No. 3. This order establishes plugging and abandonment procedures which have general application to all wells drilled for oil and gas. All casings, wellhead equipment, and pilings must be removed to a depth of at least 5 meters (16 feet) below the ocean floor unless another depth is approved by the Geologic Survey District Supervisor.

OCS Order No. 4. This order sets out criteria for demonstrating the capability of a well to produce paying quantities of oil or gas.

OCS Order No. 5. This order contains detailed procedures for the installation, design, testing, operation and removal of subsurface safety devices.

OCS Order No. 6. This order sets specifications for workover procedures, including testing, and wellhead fitting, valves and casing heads. It relates to production operations only.

OCS Order No. 7. This order requires that the lessee prevent pollution of the ocean, prescribes certain pollution control measures, and prohibits disposal of any waste materials into the ocean that will create conditions which will adversely affect the public health, life, property, aquatic life, wildlife, recreation, navigation, commercial fishing, or other uses of the ocean. Disposal of waste materials is regulated by the Environmental Protection Agency pursuant to the Clean Water Act.

OCS Order No. 8. This order establishes requirements applicable to platform and structure design and installation. It requires consideration of environmental conditions which may contribute to structure damage. This order applies to production operations.

OCS Order No. 9. This order for the Pacific Area OCS provides approval procedures for oil and gas pipelines on the OCS. All pipelines and related equipment must be designed and maintained with high-low pressure sensors, automatic shut-in valves, checkflow valves (to control backflow), and metering systems. The Order also requires adequate provisions for cathodic corrosion protection, trawling compatibility, hydrostatic testing, storm scour and other enviromental stress in OCS pipelines. Procedures and schedules for regular inspection of pipelines along with recording of such inspections are stipulated.

OCS Order No. 10. This order provides for drilling twin core holes located adjacent to core holes drilled on the OCS under earlier California State authorization. Such holes were drilled prior to the establishment of Federal authority beyond the 3-mile limit.

OCS Order No. 11. This order sets requirements for maximum efficient recovery rate for oil and gas from a lease, and establishes production rates. It also provides procedures to shut-in wells, due to over-production or storms, and for producibility tests. It applies to production only.

OCS Order No. 12. This order sets forth requirements for public inspection of records. It details what information, which the lessee provides to the U.S. Geological Survey, is considered public and how this information should be transmitted to the Survey in order for it to be made publically available.

6. Standard Lease Stipulations: To mitigate known impacts that have become apparent during environmental analysis, stipulations that have been developed during past Sales are recommended so that those potential impacts can be reduced or eliminated. The following stipulations to the lease are planned.

a. Biological Stipulation

(To apply to all leases resulting from this lease sale.)

(a) If the Deputy Conservation Manager has reason to believe that biological populations or habitats exist and require protection, he shall give the lessee notice that the lessor is invoking the provisions of this stipulation and the lessee shall comply with the following requirements. Prior to any drilling activity or the construction or placement of any structure for exploration or development on lease areas including, but not limited to, well drilling and pipeline and platform placement, hereinafter referred to as "operation," the lessee shall conduct site specific surveys as approved by the Deputy Conservation Manager and in accordance with prescribed biological survey requirements to determine the existence of any special biological resource including, but not limited to:

(1) Very unusual, rare, or uncommon ecosystems or ecotones.

(2) A species of limited regional distribution that may be adversely affected by any lease operations.

If the results of such surveys suggest the existence of a special biological resource that may be adversely affected by any lease operation, the lessee shall: (1) relocate the site of such operation so as not to adversely affect the resources identified; (2) establish to the satisfaction of the Deputy Conservation Manager, on the basis of the site specific survey, either that such operation will not have a significant adverse effect upon the resource identified or that a special biological resource does not exist. The Deputy Conservation Manager will review all data submitted and determine, in writing, whether a special biological resource exists and whether it may be significantly affected by lessee's operations. The lessee may take no action until the Deputy Conservation Manager has given the lessee written directions on how to proceed.

(b) The lessee agrees that if any area of biological significance should be discovered during the conduct of any operations on the leased area, he shall report immediately such findings to the Deputy Conservation Manager, and make every reasonable effort to preserve and protect the biological resource from damage until the Deputy Conservation Manager has given the lessee directions with respect to its protection.

Evaluation of Effectiveness. The biological stipulation was designed to allow leasing activities to occur while providing protection to biological habitats. This stipulation was developed in consultation with the Fish and Wildlife Service, and requires that the lessees conduct environmental surveys when the DCM believes them to be necessary.

Requiring site surveys provides for identification of specific areas which must be avoided in locating bottom-founded equipment and facilities. By imposing the biological stipulation, the unique organisms and habitats in these areas are adequately protected, while allowing the lessee to locate uninhabited areas for the placement of drilling structures which are compatible to the area. Therefore, the adverse impacts identified throughout the pre-lease process for this issue are believed to be adequately mitigated.

b. Cultural Resource Stipulation

(To apply to all leases resulting from this lease sale.)

If the Deputy Conservation Manager, having reason to believe that a site, structure or object of historical or archaeological significance, hereinafter referred to as a "cultural resource," may exist in the lease area, gives the lessee written notice that the lessor is invoking the provisions of this stipulation, the lessee shall upon receipt of such notice comply with the following requirements.

Prior to any drilling activity or the construction or placement of any structure for exploration or development on the lease, including but not limited to, well drilling and pipeline and platform placement, hereinafter in this stipulation referred to as "operation," the lessee shall conduct remote sensing surveys to determine the potential existence of any cultural resource that may be affected by such operations. All data produced by such remote sensing surveys as well as other pertinent natural and cultural environmental data shall be examined by a qualified marine survey archaeologist to determine if indications are present suggesting the existence of a cultural resource that may be adversely affected by any lease operation. A report of this survey and assessment prepared by the marine survey archaeologist shall be submitted by the lessee to the Deputy Conservation Manager and the Manager, Bureau of Land Management (BLM), Outer Continental Shelf (OCS) Office for review.

If such cultural resource indicators are present the lessee shall: (1) locate the site of such operation so as not to adversely affect the identified location; or (2) establish, to the satisfaction of the Deputy Conservation Manager, on the basis of further archaeological investigation conducted by a qualified marine survey archaeologist or underwater archaeologist using such survey equipment and techniques as deemed necessary by the Deputy Conservation Manager, either that such operation shall not adversely affect the location identified or that the potential cultural resource suggested by the occurrence of the indicators does not exist.

A report of this investigation prepared by the marine survey archaeologist or underwater archaeologist shall be submitted to the Deputy Conservation Manager and the Manager, BLM OCS Office for their review. Should the Deputy Conservation Manager determine that the existence of a cultural resource which may be adversely affected by such operation is sufficiently established to warrant protection, the lessee shall take no action that may result in an adverse effect on such cultural resource until the Deputy Conservation Manager has given directions as to its preservation.

The lessee agrees that if any site, structure, or object of historical or archaeological significance should be discovered during the conduct of any operations on the leased area, he shall report immediately such findings to the Deputy Conservation Manager and make every reasonable effort to preserve and protect the cultural resource from damage until the Deputy Conservation Manager has given directions as to its preservation.

Evaluation of Effectiveness: BLM has engaged in studies to evaluate the potential of cultural resources in the Southern California OCS area. The lessee or agent, during any activities on the leasehold, is required to report any findings to the Deputy Conservation Manager in the event any site or object of historic or archaeologic significance should be discovered. The lessee is also required to make every reasonable effort to preserve and protect such site or object from damage until the Deputy Conservation Manager makes a determination on its preservation. Through the imposition of this stipulation and compliance with applicable Federal and State laws regarding cultural resources, it is believed potential impacts to cultural resources are adequately mitigated.

c. Geological Stipulation

Mass Movement Tracts. Any tracts identified by the United States Geological Survey (USGS) as hazardous, due to their location on sea floor areas subject to mass movement, will be subject to the following stipulations:

Exploratory drilling operations, emplacement of structures (platforms) or seafloor wellheads for production or storage of oil or gas, and the emplacement of pipelines will not be allowed within the potentially unstable portion of a lease block unless or until the lessee has demonstrated to the Deputy Conservation Manager's satisfaction that mass movement of sediments is unlikely or that exploratory drilling operations, structures (platforms), casing, wellheads and pipelines can be safely designed to protect the environment in case such mass movement occurs at the proposed location. This may necessitate that all exploration for and development of oil or gas be performed from locations outside of the area of unstable sediments, either within or outside of this lease block.

If exploratory drilling operations are allowed, site specific surveys shall be conducted to determine the potential for unstable bottom conditions. If emplacement of structures (platforms) or seafloor wellheads for production or storage of oil or gas is allowed, all such unstable areas must be mapped. The Deputy Conservation Manager may also require soil testing before exploration and production operations are allowed.

Submarine Canyons or Channels Tracts. Any tracts identified by USGS as hazardous, due to the presence of submarine canyons or channels on all or portions of the tracts, will be subject to the following stipulation:

Exploratory drilling operations, emplacement of structures (platforms) or seafloor wellheads for production or storage of oil or gas or emplacement of pipelines will not be allowed within the potentially unstable portions of this lease block unless or until the lessee has demonstrated to the Deputy Conservation Manager's satisfaction that exploratory drilling operations, structures (platforms), casing, wellheads and pipelines can be safely designed to protect the environment at the proposed location. This may necessitate that all exploration for and development of oil or gas be performed from locations outside of the area of submarine canyons or channels, either within or outside of this lease block.

If exploratory drilling operations are allowed, site specific surveys shall be conducted to determine the potential for unstable bottom conditions. If emplacement of structures (platforms) or seafloor wellheads for production or storage of oil or gas are allowed, all such unstable areas must be mapped. The DCM may also require soil testing before exploration and production operations are allowed.

Active Faults Tracts. Any tracts identified by USGS as tracts that include a portion of, or are immediately adjacent to, a major active fault zone will be subject to the following stipulations:

Exploratory drilling operations, emplacement of structures (platforms) or seafloor wellheads for production or storage of oil or gas and the emplacement of pipelines will not be allowed in the vicinity of the fault until the lessee has demonstrated to the Deputy Conservation Manager's satisfaction that exploratory drilling operations, structures (platforms), casing, wellheads, and pipelines can be safely designed to protect the environment in case fault movement occurs at the proposed location. This may necessitate that all exploration for and development of oil or gas be performed from locations outside of the area of potential fault movement, either within or outside of this lease block.

If exploratory drilling operations are allowed, site specific surveys shall be conducted to determine the potential for active faulting. If emplacement of structures (platforms) or seafloor wellheads for production or storage of oil or gas are allowed, all fault zones must be mapped. The Deputy Conservation Manager may also require soil testing before exploration and production operations are allowed.

Evaluation of Effectiveness. The geological stipulations were developed in consultation with USGS. The stipulations require that exploratory drilling operations, emplacement of structures (platforms) or seafloor wellheads for production or storage of oil or gas, and the placement of pipelines be safely designed to protect the environment in case mass movement, unstable areas associated with submarine canyons or channels, or fault movement occur either within or outside of the particular lease block. Mapping is required if emplacement of structures (platforms) or seafloor wellheads for production or storage of oil or gas are allowed in all such unstable areas. Consequently, it is believed that all potential geological hazards are adequately mitigated.

d. Military Stipulation No. 1

This stipulation applies to those tracts located in military operating areas. The tracts affected are listed with the appropriate military geographical area coordinator.

Tracts 1 through 49, 52 through 54, 56 through 68, 70 through 75, 78 through 98, 101 through 103, 105 through 107, 112 through 115, 117 through 127, 130 through 135, 139 through 144, 148 through 150, and 153 through 158: Commander, Western Space and Missile Center (WSMC) and the Commander, Pacific Missile Test Center (PMTC), or other appropriate military agency.

Tracts 128, 129, 136 through 138, 145 through 147, 151, 152, and 159 through 221: Commander, Fleet Area Control and Surveillance Facility (FACSFAC), or other appropriate military agency.

(a) The lessee agrees that prior to operating or causing to be operated on its behalf boat or aircraft traffic into individual, designated warning areas, the lessee shall coordinate and comply with instructions from the Commander, Western Space and Missile Center (WSMC), the Commander, Pacific Missile Test Center (PMTC), and Commander, Fleet Area Control and Surveillance Facility (FACSFAC), or other appropriate military agency. Such coordination and instruction will provide for positive control of boats and aircraft operating in the warning areas at all times.

(b) The lessee, recognizing that mineral exploration and exploitation and recovery operations of the leased areas of submerged lands can impede tactical military operations, hereby recognizes and agrees that the United States reserves and has the right to temporarily suspend operations of the lessee under this lease in the interests of national security requirements. Such temporary suspension of operations, including the evacuation of personnel, and appropriate sheltering of personnel not evacuated (an appropriate shelter shall mean the protection of all lessee personnel for the entire duration of any Department of Defense activity from flying or falling objects or substances), will come into effect upon the order of the Deputy Conservation Manager, after consultation with the Commander, Western Space and Missile Center (WSMC), the Commander, Pacific Missile Test Center (PMTC), and the Commander, Fleet Area Control and Surveillance Facility (FACSFAC), or other appropriate military agency, or higher authority, when national security interests necessitate such action. It is understood that any temporary suspension of operations for national security may not exceed seventy-two hours; however, any such suspension may be extended by order of the Deputy Conservation Manager. During such periods equipment may remain in place.

(c) The lessee agrees to control his own electromagnetic emissions and those of his agents, employees, invitees, independent contractors or subcontractors emanating from individual, designated defense warning areas in accordance with requirements specified by the Commander, Western Space and Missile Center (WSMC), the Commander, Pacific Missile Test Center (PMTC), and the Commander, Fleet Area Control and Surveillance Facility (FACSFAC), or other appropriate military agency, to the degree necessary to prevent damage to, or unacceptable interference with, Department of Defense flight, testing or operations activities conducted within individual, designated warning areas. Necessary monitoring, control, and coordination with the lessee, his agents, employees, invitees, independent contractors or subcontractors, will be effected by the Commander of the appropriate onshore military installation conducting operations in the particular warning area: provided, however, that control of such electromagnetic emissions shall permit at least one continuous channel of communication between a lessee, its agents, employees, invitees, independent contractors or subcontractors and onshore facilities.

e. Military Stipulation No. 2

(To apply to all leases resulting from this lease sale.)

In order to indemnify and save harmless the United States, this stipulation will apply to all leases resulting from this sale.

Whether or not compensation for such damage or injury might be due under a theory of strict or absolute liability or otherwise, the lessee assumes all risks of damage or injury to persons or property, which occurs in, on, or above the Outer Continental Shelf, to any person or persons or to any property of any person or persons who are agents, employees or invitees of the lessee, its agents, independent contractors or subcontractors doing business with the lessee in connection with any activities being performed by the lessee in, on, or above the Outer Continental Shelf, if such injury or damage to such person or property occurs by reason of the activities of any agency of the U.S. Government, its contractors, or subcontractors, or any of their officers, agents or employees, being conducted as a part of, or in connection with, the programs and activities of the Western Space and Missile Center (WSMC), the Pacific Missile Test Center (PMTC), or other appropriate military agency.

Notwithstanding any limitations of the lessee's liability in section 14 of the lease, the lessee assumes the risk whether such injury or damage is caused in whole or in part by any act or omission, regardless of negligence or fault, of the United States, its contractors or subcontractors, or any of their officers, agents, or employees. The lessee further agrees to indemnify and save harmless the United States against all claims for loss, damage, or injury sustained by the lessee, and to indemnify and save harmless the United States against all claims for loss, damage, or injury sustained by agents, employees, or invitees of the lessee, its agents or any independent contractors or subcontractors doing business with the lessee in connection with the programs and activities of the aforementioned military installations and agencies, whether the same be caused in whole or in part by the negligence or fault of the United States, its contractors, or subcontractors, or any of their officers, agents, or employees and whether such claims might be sustained under theories of strict or absolute liability or otherwise.

Evaluation of Effectiveness. The two military stipulations were developed in consultation with the Department of Defense. These stipulations relating to electromagnetic interference, shelter/evacuation, and holding harmless would be included in Sale No. 68 leases as they have been in previous OCS sales. It is believed that these stipulations will adequately mitigate any potential Department of Defense conflicts in the Southern California Bight.

f. Transportation of Hydrocarbon Products Stipulation

(To apply to all leases resulting from this lease sale.)

(a) Pipelines will be required: (1) if pipeline rights-of-way can be determined and obtained; (2) if laying of such pipelines is technologically feasible and environmentally preferable; and (3) if, in the opinion of the lessor, pipelines can be laid without net social loss, taking into account any incremental costs of pipelines over alternative methods of transportation and any incremental benefits in the form of increased environmental protection or reduced multiple use conflicts. The lessor specifically reserves the right to require that any pipeline used for transporting production to shore be placed in certain designated management areas. In selecting the means of transportation, consideration will be given to any recommendation of the intergovernmental planning program for assessment and management of transportation of Outer Continental Shelf oil and gas with the participation of Federal, State, and local government and the industry.

(b) Following the development of sufficient pipeline capacity, no crude oil production will be transported by surface vessel from offshore productions sites, except in the case of emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the Deputy Conservation Manager.

(c) Where the three criteria set forth in the first sentence of this stipulation are not met and surface transportation must be employed, all vessels used for carrying hydrocarbons to shore from the leased area will conform with all standards established for such vessels, pursuant to the Port and Tanker Safety Act of 1978 (PL 95-474).

Evaluation of Effectiveness. The intent of this measure is to transport hydrocarbons by the safest and environmentally preferable method. The measure has been standard for most OCS lease sales.

g. Wells and Pipeline Stipulation

(To apply to all leases resulting from this lease sale.)

(a) Wells. Subsea well heads and temporary abandonments, or suspended operations that leave protrusions above the sea floor, shall be protected, if feasible, in such a manner as to allow commercial trawl gear to pass over the structure without snagging or otherwise damaging the structure or the fishing gear. Latitude and longitude coordinates of these structures, along with water depths, shall be submitted to the Deputy Conservation Manager. The coordinates of such structures will be determined by the lessee utilizing state-of-the-art navigation systems with accuracy of at least ±50 feet (15.25 meters) at 200 miles (322 kilometers).

(b) Pipelines. All pipelines, unless buried, including gathering lines, shall have a smooth-surface design. In the event that an irregular pipe surface is unavoidable due to the need for valves, anodes or other structures, those irregular surfaces shall be protected in such a manner as to allow trawl gear to pass over the object without snagging or otherwise damaging the structure or the fishing gear.

The following was considered in assessing the need for, and adequacy of, this stipulation for the proposed lease area:

> Existing OCS Orders Nos. 1 and 3 require that all subsea objects hazardous to navigation or commercial fishing be marked by aids-to-navigation as directed by the U.S. Coast Guard. OCS Order No. 3 requires that all casing, wellheads, and pilings, when abandoned, must be removed to a minimum depth of 5 meters (16 feet) below the ocean floor; and that temporary abandonments must be identified and marked, as directed by the Coast Guard, when a casing stub extends above the ocean floor.
>
> U.S. Coast Guard regulations provide for marking and protection of subsea objects and the U.S. Coast Guard has proposed regulations, 30 CFR 147 (Federal Register, May 1, 1980), which will establish "safety zones" around OCS objects. Obstructions must be accurately reported and the location published in a public notice.
>
> Rights-of-way are subject to environmental safety assurance through regulations requiring best available and safest technology and regulatory and CZM consistency reviews (OCS Lands Act, Section 5(e), as amended).

Evaluation of Effectiveness. Although the wording of this mitigating measure has become standard, other existing measures, as discussed above, may adequately preclude the need for a special stipulation. The paragraph in the stipulation concerning pipelines was considered to be more appropriate to the stipulation for transportation of hydrocarbon products. However, due to the value of fisheries in the area, this standard measure should be adopted. There was agreement to adopt this measure at the DM 655 meeting held in Washington, D.C. on August 26, 1980.

7. Other Mitigating Actions

a. Contingency Plans: To implement the Clean Water Act, as amended, the President's Council on Environmental Quality developed the National Oil and Hazardous Substances Pollution Contingency Plan following specific legislative directions to include: 1) the duties and responsibilites of each Federal agency in coordination with State and local agencies; 2) a strike force of trained personnel available to provide the earliest possible notice of a discharge; 3) a system of surveillance to provide the earliest possible notice of a discharge; 4) a national center to coordinate the plan; and 5) procedures and techniques for identifying, containing, and removing the discharge (or dispersing it if necessary).

The Clean Water Act establishes the Environmental Protection Agency and the Coast Guard as enforcing agencies. These agencies have the authority and the capacity to marshal the nation's capability to combat an oil spill.

As a standard part of any OCS lease, OCS Order No. 7 requires oil spill equipment to be at the site of any drilling or development operations and also requires all of the requirements listed above to be met, including a detailed site specific oil spill contingency plan. In addition, along the California Coast there are several existing oil spill cooperatives (Clean Bay in San Francisco Bay, Clean Seas at Santa Barbara, Southern California Petroleum Contingency Organization at Long Beach and Clean Coastal Water at Long Beach) along with the USCG Pacific Strike Force located in San Francisco. For additional detail, see Section IV.A.1.b.

b. Oil Spill Fund: Title III of the OCS Lands Act, as amended, establishes in the U.S. Treasury an Offshore Oil Pollution Compensation Fund to be administered by the Secretary of Transportation. This fund provides compensation for any person suffering direct or actual injury caused by the discharge of oil from an offshore facility or vessel. A fee of not more than 3¢ per barrel of oil produced on the OCS provides the monies for the fund. The fees collected may be modified or increased to maintain the fund at a level between $100 and $200 million.

Claims for economic loss that arise out of, or directly resulting from, oil pollution may generally be asserted against the fund by any claimant for damages and removal costs. A U.S. claimant (who owns or leases property so damaged or who utilizes a natural resource involved) may file for injury to or destruction of real or personal property, loss of use of real or personal property, and loss of use of natural resources. The President may assert claims for injury to or destruction of natural resources over which the Federal Government exercises sovereign rights or exclusive management authority, as may a State for natural resources owned or managed by the State. Lost profits or impaired earning capacity may be claimed by a United States claimant who derives at least 25 percent of his earnings from activities using property or natural resources affected by oil pollution. Federal, State, and local governments may also assert claims for tax revenue lost due to injury to real or personal property.

Owners and operators of offshore facilities are held strictly liable for all loss attributable to oil pollution from their facilities. Except in cases of gross negligence, willful misconduct, or violation of safety regulations, vessel liability is limited to $250,000 or $300 per gross ton, whichever is greater. For an offshore facility, liability is limited to the total cleanup and removal costs, and $35 million in damages. Evidence of financial responsibility adequate to satisfy the maximum amount of liability must be provided.

Upon payment of compensation for economic loss compensable under Title III, the fund becomes subrogated to all rights, claims, and causes of action of the claimant.

c. Fishermen's Contingency Fund: Title IV of the OCS Lands Act, as amended, establishes a Fishermen's Contingency Fund in the U.S. Treasury. The purpose of this fund is to compensate U.S. commercial fishermen (including operators of commercial passenger fishing vessels) for damages caused by materials, equipment, tools, containers, or other items associated with oil and gas exploration, development, and production when no financially responsible party can be identified. Damages covered by the fund include: 1) loss of profits for the owner, operator, and crew; 2) damage to, or loss of fishing gear and vessels; 3) fuel costs; and 4) reasonable attorneys' fees (unless the claim is denied).

A claim is presumed to be caused by items associated with OCS oil and gas exploration, development, or production activities if it is filed orally or in writing within five (5) days after the date when the damage or loss is discovered, and provides the preliminary information required by the regulations. A more detailed report must then be filed no later than sixty (60) days after the date the damage or loss is discovered. However: 1) the damage must have occurred in an area affected by OCS oil and gas exploration, development, or production activities as defined in the regulations; 2) the amount of the award will be reduced to the extent that the damage was caused by the negligence or fault of the commercial fishermen making the claim; 3) the claim will be reduced by the amount of compensation recoverable from insurance; 4) the damage or loss cannot be known to be caused by a natural obstruction or an obstruction unrelated to OCS oil and gas exploration, development, or production activities; 5) there must not be a record on the most recent nautical charts issued by the National Ocean Survey, NOAA, or in any weekly Notice to Mariners issued by the Defense Mapping Agency Hydrographic/Topographic Center on or before the date of the damage that an obstruction existed in the immediate vicinity where the damage or loss occurred; 6) there must not be a proper surface marker or lighted buoy attached, or closely anchored to the obstruction. When damage occurs within a one-quarter mile radius of obstructions recorded on charts or in a Notice to Mariners, or are properly marked, it is presumed to involve the recorded obstruction and negligence or fault of the claimant is presumed unless the claimant can prove otherwise.

If a commercial fisherman does not file a claim within five (5) days, he may still receive compensation. However, the claim must be filed within 60 days after the date when the damage or loss is discovered and the claimant has the burden of proof to establish: 1) the identity or nature of the item which caused the damage; and 2) that the item which caused the damage is associated with oil and gas exploration, development, or production activities on the Outer Continental Shelf.

The Fund is divided into area accounts. California is included in the Pacific area account. Each area account cannot exceed $100,000, but, if depleted, it will be replenished. The total amount in the fund, at one time, cannot exceed $1 million. Money for each area comes from holders of leases, exploration permits, easements, or right-of-ways for the construction of pipelines. The Secretary of Commerce specifies the amount to be paid but it may not exceed $5,000 per lease, permit, easement or right-of-way in any calendar year; the Secretary of the Interior collects the money. Final regulations developed by the National Marine Fisheries Service for implementing the Fishermen's Contingency Fund are described in 50 CFR Part 296.

Furthermore, to comply with the OCS Lands Act, as amended, National Ocean Survey (U.S Department of Commerce) is conducting a survey of natural and man-made obstructions on the OCS that pose potential hazards to commercial fishing or fishing gear. Charts identifying these hazards will be developed for commercial fishermen. Initially, this survey shall concentrate on areas where OCS oil and gas production has or will soon commence.

d. Oil Spill Prevention and Mitigation: The prevention and mitigation of oil spills has historically been a prime consideration in OCS resource management. Prevention and mitigation measures are identified and required by the OCS Orders implemented by the U.S. Geological Survey as a standard part of any OCS lease sale. OCS Orders Nos. 2, 5, 7, and 8 specifically provide for the mitigation of oil spills through provisions for safety systems, pollution control equipment, personnel training and platform integrity verifications. These are reflected in that, industry has drilled over 16,000 offshore wells since 1956 with an impressive safety record. Last year, only two oil spills of more than 50 bbl occurred within U.S. OCS waters, with the larger one involving 135 bbl of oil.

e. Oil Spill Modeling: An oil spill risk analysis model has been developed and utilized which quantitatively determines the likelihood of oil spill impact on particular areas and/or resource categories. The model results are discussed in Section IV.A.1.

f. Prevention of Groundwater Contamination: The isolation of freshwater strata from potential contaminants in a borehole is insured by well casing, cementing and plugging regulations set forth in the Code of Federal Regulations (30 CFR Part 250.41) and OCS Orders Nos. 2 and 3. These regulations set forth the procedures to be undertaken during drilling and abandonment of OCS wells in order to ensure the isolation of oil, gas, and freshwater zones in the strata in which they are found, and prevent them from escaping into other strata or to the surface.

These measures should effectively maintain the purity of any freshwater aquifers which might be drilled through during OCS exploration and development activities.

In addition, Coastal Energy Impact Program (CEIP) formula grants can pay for costs of planning and development of new or improved public services and facilities (including water supply). CEIP is discussed in Section I.B.3.b and the regulations are detailed in the Code of Federal Regulations (15 CFR 931). Environmental and Recreation Loss Grants may be awarded to help prevent, reduce, or ameliorate unavoidable losses to environmental resources (including water quality) from OCS exploration or production (e.g., paying for a freshwater siphon to reduce damage to a freshwater source by salt water intrusion resulting from coastal energy activity). CEIP Planning Grants assist local governments to plan environmental consequences of coastal dependent energy activities affecting the coastal zone, and Credit Assistance is available to finance new or improved facilities in communities experiencing unplanned and unbudgeted demands upon their public services and facilities from coastal energy activity.

g. Exploration and Development Plans: The OCS Lands Act Amendments of 1978 placed additional requirements on lessees relative to Exploration and Development Plans. This section will note particular aspects of these Plans as they relate to exploration and development activities in the Sale No. 68 area.

The holder of an OCS oil and gas lease is required to submit an exploration plan to the Secretary of the Interior (or his designee) prior to commencing exploration. The Exploration Plan is required to include: 1) a schedule of anticipated exploration activities; 2) a description of the equipment which will be used; 3) the general location of each well that is to be drilled; and 4) any other information deemed pertinent by the Secretary.

The Secretary of the Interior is required to disapprove any plan which would result in any condition which "...would probably cause serious harm or damage to life (including fish and other aquatic life), to property, to any mineral (in areas leased or not leased), to the national security or defense, or to the marine, coastal, or human environment" (OCSLAA Sec. 5(a)(2)(A)(i)), if the proposed activity cannot be modified to avoid these conditions.

Additionally, approval will not be given to a plan if the exploratory activity would affect "...any land use or water use in the coastal zone of a State with a coastal zone management program approved pursuant to Section 306 of the Coastal Zone Management Act of 1972 (16 U.S.C. 1455)..." unless and until the prescribed consistency provisions of the CZM Act have occurred.

A plan is also required prior to development and production on any lease within the Pacific OCS region. Such a plan must be similarly approved by the Secretary of the Interior. The plan is required to set forth: 1) the specific work to be performed; 2) a description of all facilities which will be constructed or utilized, including their location and size; 3) all environmental safeguards and safety standards, and how such are to be implemented and met; 4) an expected rate of development and production; and 5) any other relevant information which regulations may require OCSLAA Sec. 25(c). The development and production plan is also required to meet those provisions of the Coastal Zone Management Act noted above.

The Secretary of the Interior is required to find at least once that a development and production plan in a frontier area is a major Federal action. As such, preparation of an environmental impact statement is required, including all the attendant procedures of the National Environmental Policy Act of 1969. Other development and production plans must allow 60 days for comments and recommendations from the Governor and/or the Executives of any affected local governments. In addition, any interested person may submit comments and recommendations.

h. Structural Verification Program: This program established by USGS, is designed to assure that offshore oil and gas structures are designed, constructed and installed using standardized procedures to prevent structural failures. Lessees are required to submit detailed information on any proposed structure to be erected. The program facilitates review of these structures. The program utilizes third party expertise and technical input in the verification process through the use of a Certified Verification Agent.

One consideration particularly important to the California OCS will be meeting structural design criteria for seismic events. Design is performed for two levels of a seismic incident - an operational level and a safety level. At the safety level, damage to and deformation of the structure is allowable, but the strength must be adequate to prevent collapse.

Determination of the acceleration forces to which the structure may be subjected is made by calculating the magnitude of the maximum probable and maximum credible earthquake likely to be generated by faults in the vicinity of the structure.

Bedrock acceleration at the site of the structure is related to the magnitude of an earthquake and its distance from the location. Bedrock acceleration is affected by the character of the overlying soils. In most instances, the overlying soils tend to reduce the forces of acceleration applied to the structure but in rare cases can amplify it. Once the seismic forces to which a structure may be subjected have been established, the structure is designed to withstand those forces.

Seismic activity has less of an effect on pipelines that are free to move. An unconfined pipeline has sufficient flexibility and elasticity that nominal seismic movement may have little effect on the integrity of the pipeline. However, if the pipeline is buried, the inherent flexibility and elasticity of the pipeline may be reduced to a point that damage is incurred.

Pipelines that cross potentially active faults that reach the surface require special consideration. Geophysical examination of the shallow portion of a fault trace may provide information on the date of the latest movement of the fault. In the absence of proof of recent activity at the tract of a fault, potential damage to the pipeline may be eliminated or minimized by crossing the fault tract in such a manner that the flexibility and elasticity of the pipeline are maximized.

i. Notices to Lessees and Operators: These notices have the same effect or status as OCS Orders and Regulations and are used when expeditious clarifications, corrections, or additions to the orders and regulations are necessary. The NTL's effective as of March 1, 1977, except for NTL 78-1 which was effective as of October 23, 1978, are:

NTL 77-1 - "Applications for Exploratory Operations"
NTL 77-2 - "Minimum Requirements for Shallow Drilling Hazards"
NTL 77-3 - "Minimum Cultural Resource Survey Requirements"
NTL 78-1 - "Minimum Requirements for Biological Surveys"
NTL * - "Royalty Payments on Oil and Gas Lost", as revised

The purpose of these notices is to keep lessees and operators informed as to what the USGS requires prior to approving proposals to conduct exploratory drilling operations. The text of Notices to Lessees and Operators which are currently in effect for the Pacific OCS area are on file with U.S. Geological Survey, Conservation Division, Los Angeles, California.

j. Aircraft Overflight Restrictions: Aircraft are presently restricted by existing State and Federal regulations from flying at altitudes below 1,000 feet near important pinniped and seabird terrestrial habitats on the Channel Islands, Ano Nuevo and Farallon Islands. Additionally, potential lessees will be notified in the proposed notice of sale by the Instructions to Lessees to avoid flying at altitudes less than 1,000 feet near all seabird nesting and pinniped rookery areas of Southern California. The existing restrictions should protect the majority of California seabird and marine mammals from aerial harrassment. The additional restrictions will provide additional protection to marine mammals and seabirds.

[*] No NTL number has been assigned.

8. Interrelationship of Proposal with Other Projects and Proposals

a. Coastal Zone Management: The California Coastal Management Program (CMP), developed according to the provisions of the Coastal Zone Management Act, was approved by the Secretary of Commerce in 1978. The Program provides policies and regulatory authorities to ensure long-range conservation, utilization, and orderly development of California's coastal resources. The California CMP is comprised of two segments: The Management Program for San Francisco Bay (1977) which provides for resource management by the Bay Conservation and Development Commission (BCDC); and the California Coastal Act (1976) which, in addition to setting forth land use policies for the coastal zone, formally establishes the California Coastal Commission as the oversight body in coastal resource management for California. As noted in Section I.B.3.b above, any action that directly affects the coastal zone must be consistent, to the maximum extent practicable, with the California Coastal Management Plan. The BCDC and the California Coastal Commission review and concur with the determination on such actions.

The policies of the Coastal Act and resulting California Coastal Management Program address the following areas of concern: public access, recreation, marine environment, land resources (including environmentally sensitive habitats and agriculture), residential development, energy facilities siting, and industrial development. The primary vehicle for implementing the CMP is the local coastal program (LCP). Each of 67 jurisdictions, those wholly or partially within the coastal zone as defined by the California Coastal Commission, must have an LCP approved and certified by the Commission before it can assume the permitting authority presently held by the Commission. Each LCP is comprised of two parts: a land use plan and zoning ordinances necessary to implement that plan. The two phases may be certified and approved separately, though permitting authority is contingent upon the adequacy of the entire LCP.

As of October 31, 1980, twelve complete LCPs and all four port master plans required by the Coastal Act had been certified. Of these, the cities of Trinidad and Long Beach and the Ports of Hueneme, Los Angeles, and Long Beach have assumed permit issuing responsibilities. The California Coastal Commission estimates that 25 more complete LCPs will have been certified by the July 1, 1981 deadline set forth in the Coastal Act. In addition, a number of land use plans will have been certified and several will have been completed but not certified.

The LCPs address issues of major concern within the individual jurisdictions. Several local jurisdictions along the Southern California Bight have noted that sensitive ecological habitats, wetlands, commercial/recreational boatings and coastal marine resources are major issues. A few have noted concern regarding limitations on public works facilities. One, Ventura County, specifically addresses energy facility sitings. A number of other issues are of concern to the local jurisdictions (access, visitor-serving uses, etc.), but are not of immediate concern with respect to potential effects from OCS development. None of the approved LCPs which address the above concerns are directly affected by the proposal. Should concern arise with respect to these issues, the LCPs may incorporate (or, in the case of approved LCPs, be amended to include) policies, etc., to ameliorate potential impacts.

As required by the Coastal Zone Mangement Act, each State's management program must include a planning process for energy facilities likely to be located in, or which may significantly affect, the coastal zone, including, but not limited to, a process for anticipating and managing the impacts from such facilities (Section 305(b)(8)).

Article 7 of California's Coastal Act deals with Industrial Development Planning and Management policies. Sections 30260-30263 of the California Public Resources Code address coastal-dependent industrial facility siting and policies relating specifically to oil and gas development. The energy facility planning process is developed and implemented through the LCP process. The local jurisdictions identify possible energy facility issues to be addressed in their LCPs. This involves consultation and coordination with energy suppliers that may be interested in locating within the jurisdiction. The Coastal Energy Impact Program (CEIP) funds are presently being utilized for evaluating and recommending possible energy facility sites within the jurisdictions. Also, they can be used for planning facilities to accommodate any impacts from such sitings and programs to mitigate impacts from energy activity directly affecting the coastal zone.

In general, consolidation of energy and industrial facilities is encouraged by the State, except in situations where it is beneficial to choose new areas for this use.

b. Marine Sanctuaries, and Oil and Gas Sanctuaries: Under the Marine Protection, Research, and Sanctuary Act of 1972 (16 U.S.C. 1431-1434), the Secretary of Commerce, with the approval of the President, is empowered to designate areas as Federal marine sanctuaries for the purpose of preserving or restoring such areas for their conservation, recreation, ecological, or esthetic values, following consultation with the Secretaries of State, Defense, Interior, and Transportation, with the Administrator of EPA, and with other interested agencies. Once an area is designated a marine sanctuary, the National Oceanic and Atmospheric Administration Office of Coastal Zone Management is required to issue "necessary and reasonable regulations" for control of activities permitted within the marine sanctuary. Multiple uses, including oil and gas development could be permitted within a marine sanctuary, providing these uses comply with the regulations governing the sanctuary.

The Channel Islands National Marine Sanctuary is the only marine sanctuary within the proposed Sale No. 68 area. The objectives of the marine sanctuary are to preserve a unique and strategically located ecosystem (intertidal, subtidal benthos, pinnipeds, seabirds, recreation, and cultural resources), to encourage scientific research, and to enhance public awareness of the sanctuary resources. The boundaries of this sanctuary are defined as the ocean area from the mean high tide line to a distance of 6 nm around San Miguel, Santa Rosa, Santa Cruz, Anacapa and Santa Barbara Islands. The islands themselves are not part of the sanctuary. The California Department of Fish and Game and the National Marine Fisheries Service are responsible for the regulation of fishing within the sanctuary boundaries.

The State of California has established three oil and gas sanctuaries in the region extending out to the 3-mile limit of the State's jurisdiction. These areas are specifically excluded from oil and gas leasing pursuant to the State of California Public Resources Code, Sections 6871.1, 6871.2(a), 6871.2(b).

Administered by the State Lands Commission, these sanctuaries were established to give the State the authority to regulate oil and gas development in State waters, but do not contain any restrictions on the placement of pipelines from the OCS. For location of these sanctuaries, see Maxi Visual.

c. Channel Islands National Park: On March 5, 1980, through Public Law 96-199 per 16 U.S. Code 410, Santa Barbara, Anacapa, most of Santa Cruz Santa Rosa, Prince and San Miguel Islands, including the rocks, islets, submerged lands, and waters within 1 nautical mile (nm) of each island became a National Park. The purpose of the park is defined below.

Protect the nationally significant natural, scenic, wildlife, marine, ecological, archaeological, cultural, and scientific values of the Channel Islands in the State of California, including, but not limited to, the following:

(1) The brown pelican nesting area;
(2) The undisturbed tide pools providing species diversity unique to the eastern Pacific coast;
(3) The pinnipeds which breed and pup almost exclusively on the Channel Islands, including the only breeding colony for northern fur seals south of Alaska;
(4) The Eolian landforms and caliche;
(5) The presumed burial place of Juan Rodriques Cabrillo; and
(6) The archaeological evidence of substantial populations of Native Americans.

The park extends for 1 nm into the sea. California Fish and Game maintains control over the fishing regulations and principal regulations of the subtidal biological resources through a cooperative program with the National Park Service. Close cooperation with National Marine Fisheries Service in the Channel Islands National Marine Sanctuary is also required.

d. Sewage Outfalls: Over one billion gallons of effluents per day are discharged from sewage outfalls in the Southern California Bight. This has had and continues to have a very significant impact upon marine life. For a discussion of this topic, see Section III.A.3.

e. Other: In addition to proposed OCS Sale No. 68, numerous other proposals and public and private projects will be ongoing at the same time in the Southern California coastal area. A description of these projects and proposals and the development assumptions are included in Section III.C.2 (Coastal Economy). These projects and proposals also provide the basis for the cumulative impact analysis of Section IV, Environmental Consequences of the Proposed Sale.

CHAPTER II

II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

This section analyzes five alternative actions, including the total Sale offering as Alternative 1. Other alternatives are: 2) delete those portions of all tracts within the Channel Islands National Marine Sanctuary, 3) cancel the Sale, 4) delay the Sale and 5) other alternatives. The last alternative discusses some of the ways the Secretary could recombine various alternatives to the proposed action.

A. Resource Estimates and Activities Estimated to Result from the Proposed Sale

Resource estimates and activities estimated to result from the proposed Sale are discussed in detail in Section I.B.1. The following 2 paragraphs briefly summarize that information.

Two hundred eighteen (218) tracts with a total area of about 445,190 hectares (1,112,975 acres) are being considered. The tracts are divided into 3 subareas, the Santa Barbara Channel, the Inner Banks and the Outer Banks. Estimated economically recoverable oil and gas resources (conditional mean), for each of the subareas, are as follows: Santa Barbara Channel, 67 million bbl of oil, 133 billion cubic feet of gas; Inner Banks, 70 million bbl of oil, 93 billion cubic feet of gas; and Outer Banks, 93 million bbl of oil, 436 billion cubic feet of gas. The risked mean values are less (see Table I.B.1.b-1). Production is estimated to start in 1987 and continue until 2006, with a peak in 1990. All oil produced is assumed to back out an approximately equal amount of either foreign imports or Alaskan oil to California over the life of the project. Transportation of the oil and gas is expected to be as follows: Santa Barbara Channel and the Inner Banks - oil and gas will be processed offshore and piped to shore; Outer Banks oil will be barged to Los Angeles-Long Beach and gas will be reinjected. Actual refining of all the oil is expected to occur in Los Angeles Basin refineries.

Tables I.B.1.d.1 through 4 provide detail on the expected number of exploratory and development wells, production platforms, subsea completions, miles of pipelines, drill mud and cuttings, sewage and estimates of direct employment and investment. The mean number of permanent platforms for each of the subareas are: Santa Barbara Channel 2, Inner Banks 2, and Outer Banks 4. For all areas, a total of 96 miles of offshore pipeline is expected. Investments for each of the areas, based on the conditional mean resource estimates, are: $761 million, $518 million and $859 million. Total, direct resident labor employment estimates, for each of the three subareas (assuming conditional mean resource estimates) range from 55 to a maximum of 406. For 15 of the 25 years of project life, total direct resident labor employment is projected to be only 80 individuals.

B. Analysis of Proposal and Alternatives

1. Alternative 1 - Hold the Sale as Proposed

a. Description: The description of the proposal is summarized in Section II.A and is detailed in Section I.B.1 through 8.

b. Mitigating Measures: For a detailed discussion of the mitigating measures, refer to Sections I.B.2g and m, I.B.5 through 7. Mitigating measures can be divided into several headings: 1) endangered species protection/ consultation, 2) OCS Operating Orders, 3) Standard Lease Stipulations, and 4) other mitigating measures.

Endangered species which could be affected by the proposal have been identified. Formal consultation with the FWS and NMFS has been initiated to determine if any of those species may be jeopardized. If a jeopardy determination is made, alternatives to the proposed action would be developed to protect the affected organisms.

There are 12 OCS Orders, applicable to the Pacific Region, which are mandatory requirements and specifications for oil and gas operations. They supplement other regulations. The Orders outline permit requirements, engineering criteria, surveillance, testing procedures, and information requirements.

Standard lease stipulations are designed to mitigate known impacts that have become apparent during environmental analysis. Seven stipulations are proposed for Sale No. 68. They are intended to mitigate impacts in or from the following areas: 1) biology, 2) cultural resources, 3) geological hazards, 4) and 5) military operations, 6) transportation of hydrocarbon products, and 7) wells and pipelines.

Further mitigating measures are available and are discussed (see Section I.B.7). These additional measures include: oil spill contingency plans, the oil spill fund, Fishermen's Contingency Fund, oil spill modeling, prevention of groundwater contamination, exploration and development plans, structural verification programs, and aircraft overflight restrictions.

c. Summary of Impacts: The following summary discussion of impacts will be divided into those associated with the physical, biological and socioeconomic environment. (A detailed treatment is provided in Section IV.A, B, and C.)

i. Physical Environment: Impacts in this category are essentially restricted to those affecting water and air quality.

Water quality will be degraded to a distance about 1000 m from oil platforms and drilling rigs. The long-term effects of discharges from these structures are not known. The effects of drilling fluids, formation water, small chronic leaks of hydrocarbons or the expected 1.1 spills of greater than 1,000 barrels of oil in the open ocean should be minimal, given the dilution potential of open water. Should these occur in, or migrate into restricted bays or estuaries such as Upper Newport Bay, severe water quality degradation would result. The cumulative effects of dumping of drill cuttings resulting from Sale No. 68 and previous Sales will begin to be significant, however, in general, the water quality impacts from petroleum hydrocarbons are expected to be of minor importance in the Southern California Bight in relationship to the large volumes of municipal discharges of oil and grease.

-Air quality onshore will be impacted due to increased emissions of hydrocarbons and nitrogen dioxide. Lesser quantities of sulfur dioxide, carbon monoxide, hydrogen sulfide and particulates will also be emitted. Sale No. 68-related activities will slightly increase pollutant loadings in those areas already exceeding the air quality standards. These incremental increases are below the levels considered significant by the DOI air quality regulations. For those pollutants and locations presently meeting air quality standards, the slight project-related contribution to pollutant concentrations are not expected to cause new exceedences of the standards.

ii. Biological Environment

-Plankton, the impacts of oil and gas activity from lease Sale No. 68 on both phytoplankton and zooplankton should be insignificant. Some minor plankton blooms may appear around platforms, but these are expected to be localized and short lived. Large oil spills (greater than 1000 bbls) may cause temporary local plankton population declines.

-Intertidal impacts (to the benthos) from oil spills are predicted to be low to moderate in most cases. Rocky intertidal areas within the California Bight are generally more sensitive than sandy intertidal areas. Impacts on the latter most probably will be low. The oil spill model predicts a low probability of a spill reaching shore. One land segment within Ventura County has a 5 percent probability of a hit while Santa Catalina Island with a 13 percent probability and Santa Cruz Island with a 6 percent probability are the only segments having a greater than 5 percent probability of a hit within 30 days (for a spill of 1,000 bbl or greater).

Several sensitive species and/or rocky intertidal areas may experience a high ecological loss if a spill occurs. The probabilities of a 1,000 bbl spill hitting these species and/or areas within 30 days are as follows: 1) intertidal pools of the northwest coast of San Nicolas Island (3%), 2) air breathing intertidal limpets of Santa Barbara Island (4%), 3) algae (Pelvetia) beds and abalone herds of Santa Rosa's northern coast (2%). The potential impacts to the Channel Islands National Marine Sanctuary should be reduced if the tracts within the sanctuary are not leased.

-Subtidal bottom communities would generally suffer a low ecological loss from either an oil spill or drilling operations. Generally, rocky bottoms are more impacted than soft sediment bottoms. Specific areas with benthic assemblages which could suffer a high ecological loss from oil operations are: 1) the rocky outcrops off Point Conception, which may contain unusual benthic assemblages, due to the unusual location of the area at the division point of two biogeographic provinces, 2) Santa Rosa-Cortes Ridge, because of its unusual species, 3) Tanner and Cortes Banks because of its highly productive community and coral population. Only Tanner and Cortes Banks (with a 10 percent probability of being oiled by a 1,000 bbl spill) were used in the oil spill model. The probability of an oil hit at Point Conception is approximately 0. The impacts to the benthos of the Channel Islands National Marine Sanctuary should be reduced if the tracts within the sanctuary are not leased.

Fish and fisheries probably will be impacted in the event of an oil spill. Although there are too many variables to accurately predict these impacts, low to moderate ecological losses may occur to surface fishes (e.g., Pacific bonito, jack mackerel, northern anchovy, California grunion), and temporary economic losses may be incurred by the fishing industry. The magnitude of the losses to the fishing industry will depend, in part, upon whether or not the vessels are confined to port by oil containment booms. Impacts from oil spills probably would be greatest in the Inner Banks since this area encompasses the region's most productive fishing grounds and ports.

Manmade structures could impact fish and fisheries if they disrupt the critical habitat of a species. It is not possible to determine how significant this impact will be. Mud mounds and trenches from the anchors of pipelaying barges probably will create a high impact to commercial trawlers in the Santa Barbara Channel unless a way is found to resolve this conflict. Other impacts from offshore structures are expected to be minor. No losses are anticipated from competition between the oil and gas industry and the fishing industry for berthing spaces and support services. The impact of trace metals in drilling muds on fish and fisheries is unknown. Vessel traffic, particularly seismic boats, may temporarily cause moderate impacts to the commercial fishing industry.

-Marine mammals and seabirds that frequent the waters of the Southern California Bight are, to some extent, vulnerable to impacts associated with offshore oil and gas development activities. The nature and extent of these impacts vary from species to species, season to season, and area to area within the Bight. For the two SCB (Southern California Bight) fur seal populations, oil contamination of the fur can result in hypothermia, loss of bouyancy, and death. All pinniped rookeries within the SCB are sensitive to disturbance from human intrusion; nursing pups may also be exceptionally vulnerable to the ingestion of oil. Whale species which use large sections of the Bight in their bi-annual migration, along with resident pilot whale, porpoise, and dolphin species, may be adversely affected by oil contact, noise from exploratory and development activities, and the indirect effects of resource development on the OCS environment. Seabirds of the SCB, whether nesting (resident) or migratory, may be adversely affected by oiling of plumage or the disturbance of breeding colonies and/or nesting sites. It must also be noted that projections as to the number of oil spills to result from Sale No. 68 activity are very low. These probabilities indicate that Sale No. 68 impacts on marine mammals and seabirds of the SCB will be low.

-Estuaries are potentially one of the most sensitive biological resources, relative to oil spills. If a large oil spill were to enter an estuary, a high ecological loss would result. However, most estuaries in Southern California have narrow openings, making it relatively easy to prevent oil from entering. Also, the probabilities of a hit, predicted by the oil spill model, are very low. The probabilities of a 1000 bbl spill entering one of the major, relatively unaltered estuaries within 30 days are as follows:

Mugu Lagoon	1 percent
Anaheim Bay	2 percent
Tijuana Estuary	2 percent

It is apparent, therefore, that the Southern California estuaries are not likely to be impacted.

-Terrestrial biological resources are not expected to be impacted.

iii. Socio-Economic Environment

-Demographic changes associated with Sale No. 68 economic activity are closely related to the number of new jobs. Population increases for the Southern California region are also expected to peak in 1992. The distribution among the Sale area counties for the peak year is: Santa Barbara 2,027; Ventura 1,651; Los Angeles 4,270; Orange 1,086; and San Diego 417.

-Coastal economic conditions will be affected. The development of the proposed OCS Sale No. 68 lease area would stimulate investment and would generate jobs in the Southern California region. The direct employment in offshore oil and gas activities would peak in 1986 at approximately 400 jobs. According to the results of the Curtis Harris economic model, this would generate indirect and induced employment in many other sectors of the economy. The total effect on employment, at its peak in 1992, would be an estimated 4,526 jobs. The majority of the jobs would be located in Los Angeles (2,089), Santa Barbara (843), and Ventura County (803).

-Public facility requirements may be affected by increases in the population, with a demand for additional public and private services and facilities such as schools, housing, health facilities, fire and police protection, and water supply and sewage treatment facilities. Localized stress could occur on sewage treatment facilities, especially in some of the coastal communities. However, the most significant regional impact could be on water supply systems. Southern California communities face or expect water shortages in the early 1990s. Sale No. 68 induced population growth could put additional stress on the ability to provide adequate water supplies. Although an exact accounting is not possible, the tax structure could also be affected by the increased service and facilities demand. The extent of the impact is dependent upon the amount of industrial and commercial development that occurs in areas of growing population.

-Land use impacts, from Sale No. 68, are expected to be minor. This is due to the present level of OCS activity and other industrialization in the Sale area. At present there is an oil and gas infrastructure in the area, and this should absorb any additional need for onshore facilities. Housing is already at a premium in Southern California, and will continue to be in short supply, due partially to the Space Shuttle and Missile X Programs at Vandenberg Air Force Base. Additional housing needs for Sale No. 68 are expected to be about 3,500 housing units during the peak year of 1992 as a result of both direct and indirect activity. This number is minimal in comparison to the present development in the area, but when combined with other ongoing projects the impact becomes a major concern to the local areas. Local land use plans, sewage and water moratoriums, and local zoning policies will be of help to the local communities in regulating and restricting the total development of their own areas. Thus, the total impact of Sale No. 68 on the land use is expected to be relatively minor, with development occurring in areas where the local communities are receptive to the development.

-Recreation impacts will probably be very localized and short term, with only mild economic consequences. However, they could become regional in scope and more economically damaging depending on the beach location and upon the size, duration, nature and season of the spill, and the publicity associated with it. The placement of additional platforms in the area will have a very minor effect on the recreational boating of the area. Likewise, increases in vessel traffic from the additional work boats, will have a minimal impact due to the large number of vessels already operating in the area. Tourism is the second largest industry in the Sale area, and in the event of a pollution incident, there could be localized reductions, which could have a major impact on the local community involved. Over the total Sale area, however, tourism is expected to remain normal. This is due in part to the number of non-water oriented tourist facilities in the area. Overall, the impact on the recreation industry is expected to be minor, even in the event of a pollution incident, due to the diversity of facilities which are found in the area.

-Refineries. There should be no impacts on refineries in the Los Angeles basin based on the following assumptions:

(1) Refineries have the capabilities and would process all of the crude oil from proposed Sale No. 68.

(2) Crude from Sale No. 68 would back out an equal amount of either foreign or Alaskan crude oil.

However, significant impacts could occur if crude from the Sale were of such quality that it could not be refined locally. In this case, expensive modification to the refining process might be required.

-Transportation systems. The proposal could cause the following impacts: 1) some increased employment in the shipping industry and at the ports; 2) some increased use of limited space and port resources; 3) oil spill impact rerouting of ship traffic, delayed entry or departure of ships from ports, and short-term delay in operation of power plants requiring ocean water cooling, in the event of a major spill; 4) increase cost of exploration and development due to traffic lines crossing proposed tracts; 5) slight increase in vessel accidents; 6) small increase in the number of pipeline failures, causing oil spills; and 7) minor increases in traffic movements on highways, railroads, and at airports.

-Militarily, several tracts are being evaluated that fall within the Pacific Missile Test Center, San Clemente Island Test Range and the Long Beach Naval Shipyard. Further Department of Defense/Department of the Interior negotiations are in progress to achieve a mutually satisfactory resolution.

-Cultural resources could be impacted as described below. This proposal could commit some areas of relatively shallow waters of the OCS to a permanently disturbed condition by placing large and relatively permanent sources of magnetic anomalies on the seafloor during the life of the proposed project. Because of the apparently wide distribution and the density of resources on the OCS, and because of the amount of industrial activity expected as a result of this proposal, it is possible there will be some loss of historic and prehistoric archaeological sites on the OCS. Additional losses, especially from pipelaying activities, could occur within State waters. However, mitigative efforts required of the lessees will decrease expected losses substantially. These mitigative efforts should result in a low to moderate risk to marine archaeological sites.

The level of impact for terrestrial archaeological sites is expected to be low. During the life of the proposal, the visual environment of some listed or eligible National Register sites may be adversely affected, but this is not expected. Impact to gathering activities in the intertidal zone by various ethnic groups is expected to be low to moderate, and of a temporary nature. However, indirect effects on the individuals and groups engaged in such activities could be long term. Depending on the location of industrial activities resulting from this proposal, the adverse effects on areas sacred to Native Americans is expected to be low to moderate.

-Visual resource impacts from OCS development cannot be quantified with exact certainty. However, a relative value can be assigned. This value should be used as a guide, to assess the magnitude of the impact of various OCS structures on the landscape units which comprise the Sale area. (POCS Technical Paper No. 81-5.) The shoreline was categorized from an aesthetic resource basis, and then each landscape unit was assessed for the potential impact of various OCS development scenarios. The rating was done from a landscape architectural viewpoint. When the development scenarios were incorporated into the rating system, it was determined that certain areas would have no significant impact from a landscape architectural viewpoint. Other areas would have a reduction of up to 48 points on a scale of 100. Although there are some areas in which severe impacts would occur from OCS development, in most areas the impacts would be minimal.

d. High and Low Case Estimates: The environmental impacts from proposed Sale No. 68 are based upon the conditional mean resource estimate.

This represents the "middle ground" in the estimated range of potentially recoverable oil and gas resources. This range is spread from 20-126 million bbl of oil and 46-225 billion cubic feet of gas for the Santa Barbara Channel, from 16-140 million bbl of oil and from 22-193 billion cubic feet of gas for the Inner Banks and 20-216 million bbl of oil and 70 to 811 billion cubic feet of gas for the Outer Banks.

There are six main categories of impact producing agents: 1) oil spills, 2) manmade structures offshore and onshore, 3) vessel traffic, 4) noise and other disturbances, 5) effluents and discharges, and 6) socio-economic activities. Potential impacts from the first 5 categories are almost all deleterious. Socio-economic impacts tend to be primarily positive. If discoveries are made which result in a low case development, all the potentially deleterious impacts associated with the first 5 categories above will (probably) be reduced. Sufficient data are not available to quantify the extent of this reduction relative to the level of impacts described in Section IV.C. Likewise, the potential socio-economic benefits will be reduced to an unquantifiable extent. In a rough sense, one could project that if only 50 percent of the estimated conditional mean resource were discovered, impacts would be reduced approximately 50 percent. An increase in actual, over estimated, recovery would of course increase impacts in an analogous manner.

In past California OCS Sales, initial estimates of oil and gas resources have turned out to be overly optimistic. That is, the oil and gas reserves discovered and consequently the number of platforms installed, was far less than expected. Table II.B.1.d-1 clearly shows this. Note, for example, that in all previous Southern California OCS sales, only 3 percent of those tracts sold (or 0.2 percent of those offered) ever had a production platform erected upon them. This is 6 tracts out of 182 sold, or 489 offered.

Effects of High Resource Scenario. It is possible that production could vary if anything other than the mean level of resources was recovered. For the high case, more wells would have to be drilled and more production facilities would be required. In this case, the development that was assumed for the most likely case and the additional development described below is assumed to occur. These assumptions should not be regarded as rigid productions for future events.

-Resources[(a)]. It is assumed that the conditional high level of resources would be produced (Table I.B.1.b-2). This amounts to a total of 482 million barrels of oil and 1259 billion cubic feet of gas. There will be 12 platforms and 7 subsea completions required to produce the resources. There would also be 378 exploratory and delineation wells and 339 development wells drilled.

(a) The low and high estimates computed for the combined areas do not reflect the statistically valid 5 percent and 95 percent probabilities of the individual areas because they are not statistically additive.

TABLE II.B.1.d-1

PACIFIC OCS OIL AND GAS LEASING, EXPLORATION, AND DEVELOPMENT STATISTICS

(Southern California)

Sale	Lease Nos.	Nominated	Offered	Bid	Sold	Terminated	Current	Wells Drilled Expl.	Wells Drilled Develop.	Existing Platforms	Proposed Platforms
1966	(166)	1	1	1	1	0	1	6	94	2	0
1968	(167-241)	150	110	75	71	37	34	134	239	9	2
No. 35	(242-311)	1,350	231	70	56	49	7	40	8	2	3
No. 48	(315-369)	970	148	55	54	0	54	5	0	0	0
Total		2,471	490	201	182	86	96	185	341	13	5

Nominated = Tracts nominated.
Offered = Tracts offered for sale.
Bid = Tracts bid.
Sold = Bids accepted by BLM, USGS.
Terminated = Terminated leases.
Current = Leases within the 5-year term, and those held by production, unitization agreements, or Suspension of Operations.

Expl. = Number of exploratory wells drilled.
Develop. = Number of development wells drilled.
Existing Platforms = Number of drilling and production platforms. Two platforms now under construction are included.
Proposed Platforms = Number of proposed platforms and treating facilities (OS&T is included).

SUMMARY (with respect to tracts)

Number of tracts nominated = 2,471
Number of tracts offered for sale = 489 (20 percent of those nominated)
Number of tracts sold = 182 (7 percent of those nominated)
Number of leases with drilling activities = 70 (3 percent of those nominated)
Number of leases with producing platforms = 6 (.2 percent of those nominated; 3 percent of those sold)

Compiled by USGS, March 15, 1981

-Transportation. As in the case of the expected level of development, pipeline transportation would be used for the Santa Barbara Channel and Inner Banks and Basin areas. Two oil pipelines, and two gas pipelines totaling approximately 150 miles(b) would be needed to tie into the existing network, the Santa Barbara Channel and the Inner Banks and Basins.

Because the high case estimate for gas in the Outer Banks is 8 times the risked mean, it is expected that this would cause a change from reinjecting the gas, to laying a gas pipeline along the Santa Rosa-Cortez Ridge to tie into the gas system in the Santa Barbara Channel onshore area. This would require a pipeline approximately 175 to 225 miles in length depending on the route taken, through, or around, the Channel Islands National Marine Sanctuary. Additionally, a pipeline for the oil would also be constructed. This pipeline would be the same length and parallel to the gas pipeline. Construction of these pipelines would, of course, be dependent on the cost of pipelines versus the revenues obtainable from the resources.

-Oil Storage and Pumping Stations. Oil storage will remain the same as projected for the mean, case. Another pumping station would be required if a pipeline were constructed from the Outer Banks and Basins.

-Oil Refineries. These will remain the same as projected for the mean case.

-Gas Processing Plants. The number will remain the same as projected for the mean case, although expansion of the existing units will be required to accommodate the gas from the Outer Banks.

-Operations Support Bases. These will remain the same as projected in the mean case.

-Summary of Environmental Consequences (High Resource Estimate). Assuming the high level of resources are recovered and transported to shore by pipeline, the degree of impact could more than double that described under Alternative 1 (mean resource estimate).

Impacts affecting the offshore environment from platform discharges, pipeline installation, and large oil spills could be approximately twice that expected under the mean case. A total of 440,836,000 barrels of drilling muds, 787,044,000 barrels of drill cuttings, (and 460 million barrels of formation water) could be discharged under the high case.

Biological resources would be exposed to a greater risk of impact under the high-level estimate. Planktonic and benthic communities could decrease temporarily if a significant decline in water quality occurred. Marine fish populations may be reduced from a probable increase in the number of large oil spills occurring over the life of the field. Fishing area lost to the commercial fishing industry from platforms and pipelines range from 1,566-4,700 acres (about 10 acres per developed tract) or a maximum of 0.2 percent of the total acreage in the area.

(b) The pipeline lengths stated are based on Transportation Technical Paper No. 81-1. The length was obtained by calculating the average pipeline length for each platform in the areas, and adjusting this to the high resource estimate.

A higher number of spills in the lease area could also pose a threat to sensitive coastal habitats.

Adverse impacts to marine mammals and seabirds could be increased due to the probable increase in the number of large oil spills and increases in small chronic discharges from platforms. Population declines and high mortality rates could occur.

The increased risk of oil spills could adversely affect endangered species. Brown pelicans could be exposed to a higher possibility of impact. Drilling-related impacts could increase significantly as more than twice as many wells are projected under the high case than under the mean. Higher mortality rates and population reductions could result.

Increased impacts to air quality caused by the need for additional or enlarged onshore facilities, particularly the gas processing plants, would depend on the sulfur content of any gas discovered.

Impacts to recreation and tourism could increase if the high resource estimate is recovered. There would be an increase in the probability of a spill from the lease area impacting sandy beaches.

The additional onshore support facilities required for a high case find would probably not result in any major new land use conflicts since all facilities would be sited in accordance with applicable state and local land use policies. However, the conflicts noted under Alternative 1 would still occur.

Since the resource estimates associated with this high resource scenario are about double those of the mean resource scenario for both oil and gas, forecast impacts are correspondingly greater. The total jobs induced by the Sale could total over 9,491 for the region in 1992 should the high level of resources be developed. Impacts on local communities are also expected to be greater.

-Conclusion of Environmental Consequences (High Resource Estimate). If the high level of resources are recovered and transported to shore by pipeline, more severe adverse impacts to some of the biological resources of the Southern Caliornia region could occur. The increase in severity of impacts over the mean case would be due to the greater amount of drilling discharges and increased risk of large oil spills. Coastal and marine birds and animals could suffer higher mortality rates and possible population declines.

Greater community disruption could be expected, and the impacts of communities and counties would be correspondingly higher than those associated with a mean level of resource development. Conflicts over land use and potential adverse impacts to recreation areas could be doubled over those expected under the mean case.

2. Alternative 2 - Modify the Sale by Deleting Tracts to Reduce Potential Conflicts with the Channel Islands National Marine Sanctuary

a. Description

i. Area: Between Point Conception and the Mexican Border are eight islands, referred to as the Channel Islands. They are usually divided into a northern and southern group. The northern group consists of San Miguel, Santa Rosa, Santa Cruz, and Anacapa (actually 3 separate islands). Santa Barbara, San Nicolas, Santa Catalina, and San Clemente comprise the southern group (see Maxi Visual No. 1). For a detailed discussion of these islands, refer to the following: 1) FEIS for OCS Sale No. 48 (U.S. Dept. of the Interior, 1979), FEIS on the Proposed Channel Islands Marine Sanctuary (U.S. Dept. of Commerce, May, 1980) and General Management Plan, Channel Islands National Park (National Park Service, September, 1980).

The Channel Islands National Marine Sanctuary, designated on September 22, 1980, includes only the ocean area from the mean high tide line seaward to 6 nm (see Figure II.B.2-1). The National Park includes the ocean area around the same islands (San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara) but only to a distance of 1 nm. Note, the Park, unlike the Sanctuary, also includes the land portion of the islands. Ownership on these islands is shown in Table II.B.2-1. San Nicolas, Santa Catalina, and San Clemente are not included within either the sanctuary or the National Park.

The northern Channel Islands are important for numerous reasons. Particularly significant are the marine biological, archaeological, and paleontological resources found on the islands. For example, they contain the largest and most diverse temperate water pinniped (seals and sea lions) community in the world. More than 36,900 pinnipeds, of 6 different species, were counted on the islands themselves, excluding the surrounding waters (Dohl, et al. 1980). Also there is evidence of human inhabitants going back to 30,000 years BP, and fossils of the dwarf mammoth (FEIS for OCS Sale No. 48).

ii. Alternative: This alternative would enhance protection of the Channel Islands National Marine Sanctuary and its valuable resources. It consists of deleting the 13 complete and 24 partial tracts located within the sanctuary (see Figure II.B.2-1 and Table II.B.2-2). No drilling would be allowed on any portion of any tract within the sanctuary. These tracts total approximately 38,000 hectares (94,000 acres), which is only 8.4 percent of the total proposed offering. Less than 3 percent of the total oil and gas resources estimated for the entire proposal, are located within the sanctuary.

It should be noted that there are already portions of 7 previous lease tracts with the sanctuary boundary (see Maxi Visual). North of San Miguel Island are 2 tracts that were leased in Sale No. 48 (OCS-P-356 and OCS-P-357). Approximately half of 356 is within the boundary while less than one-tenth (1/10) of 357 is. Northeast of Santa Cruz Island and north of Anacapa Island are portions of 5 tracts sold in the 1968 Santa Barbara Channel lease sale. The lease blocks and their approximate proportions within the boundary are as follows:

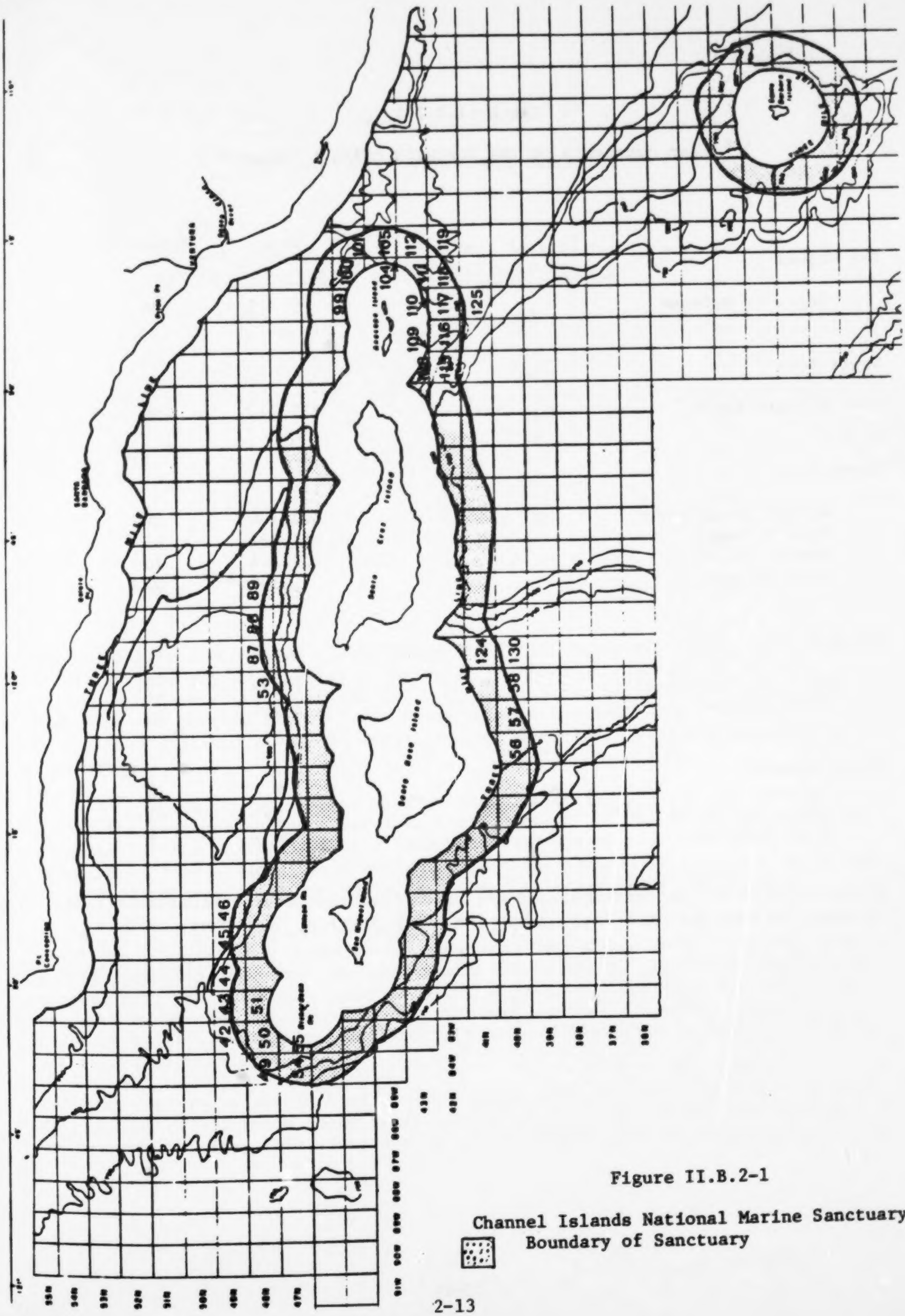
THREE MILE LINE
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Figure II.B.2-1

Channel Islands National Marine Sanctuary

▨ Boundary of Sanctuary

TABLE II.B.2-1

LAND OWNERSHIP ON THE NORTHERN CHANNEL ISLANDS*

San Miguel	Area	Percent
Dept. of Defense	9,325	100
Santa Rosa		
Vickers Ranch	52,794	100
Santa Cruz		
Nature Conservancy	12,400	20
Stanton Ranch	41,881	69
Cherini Ranch	6,264	10
Other Federal	100	01
Anacapa		
Dept. of the Interior	538	77
Other Federal	161	23
Santa Barbara		
Dept. of the Interior	595	91
Other Federal	57	9

*These Figures are Approximate, and are taken from the General Management Plan, Channel Islands National Park by National Park Service, September, 1980.

TABLE II.B.2-2

PROPOSED TRACTS WITHIN THE SANCTUARY

	Tract Totally Within Sanctuary	Tract Partially Within Sanctuary	
	50	41	88
	51	42	89
	55	43	90
	56	44	101
	99	45	105
	100	46	112
	104	49	115
	108	53	118
	109	54	119
	110	57	124
	111	58	125
	116	87	130
	117		
Total	13	Total	24

OCS-P-210 (1/8), OCS-P-205 (3/4), OCS-P-204 (3/4), OCS-P-203 (1/2), OCS-P-202 (1/20). There are no existing or proposed platforms or facilities on any portion of these 7 tracts within the boundary. There is, however, a platform - Gina - on the portion of OCS-P-201 lying outside the sanctuary. Also, it is likely that a platform will be installed, on OCS-P-205, partially outside the boundary.

b. Development Assumptions: Since the oil and gas resources within the sanctuary account for less than 3 percent of the mean risk resource estimate for the entire Sale area, changes would probably be insignificant. Deletion of these tracts would ensure, of course, that no exploratory wells/rigs or production well platforms would be located within 6 nm of the islands.

c. Summary of Impacts: The adoption of Alternative 2 would result in a significant reduction in potential impacts to intertidal and subtidal benthic organisms, marine mammals and seabirds. Potential impacts to recreational and cultural resources would be reduced slightly. For the other resource categories discussed in this document, potential impacts are not expected to be significantly different from those described in Sections II.B.1.c and IV.C (Alternative 1).

Deleting the tracts within 6 nm of the islands will increase the time required for spilled oil to reach shore by at least 4 to 5 hours, possibly by as much as 10 hours. During this time, a significant amount of evaporation, dissolution and weathering of the oil would occur, reducing the quantity and toxicity. Also, it would allow more time for oil spill clean up and containment equipment to be mobilized. The oceanographic conditions off Southern California are fairly good for handling an oil spill. With this additional time, the chances of effectively protecting sensitive marine resources are greatly increased. Specifically, the sensitive intertidal and nearshore subtidal resources and the pinniped and seabird resources would be less likely to be directly contacted by the oil. Even if the oil did reach these resources, there would be less of it; it would be more weathered; and it would be less toxic.

Increasing the distance between OCS development and these resources would also reduce the vessel traffic, human intrusion and noise generated during exploration and development. Potential disruption of critical breeding and nesting activities for seabirds and pinnipeds would, therefore, be reduced. Also, the risk of damage from platforms and pipelines, to hard bottom subtidal areas, would be eliminated. Lastly, deleterious effects from drilling muds, cuttings and formation water would be greatly reduced.

Potential impacts to recreational boating, fishing and diving within the sanctuary will be reduced by adopting Alternative 2. Cultural resources will not be subjected to the jeopardy of exploration and development activities (see Section IV.C.19).

It is important to note that these unusual and valuable resources (intertidal, subtidal benthos, pinnipeds, seabirds, recreational and cultural) were major reasons the area was designated as a National Marine Sanctuary and a National Park. Adopting Alternative 2 (deleting tracts within the sanctuary) would help maintain the characteristics and qualities that were prime reasons for designating the Northern Channel Islands as a National Marine Sanctuary and a National Park.

3. Alternative 3 - Cancel the Sale

a. Description: This alternative would constitute the no action alternative. The activities associated with the proposal would not occur. All potential physical and biological impacts arising from the discharge of drilling muds, cuttings, formation water and sewage, and those resulting from population shifts or the placement of rigs, pipelines, and related structures, would be eliminated.

If cancellation should occur, it will not preclude all oil and gas activity in the Southern California Bight. Exploration and development will continue as a result of the 1968 Sale and Sale Nos. 35 and 48, and, where commercial discoveries are made, production activities could result. In addition, another two California Sales are included on the 5-Year Leasing Schedule and it is possible that tracts in the Southern California region could be included in these proposals. If proposed Sale No. 68 were cancelled for any reason, any of the tracts included in it could possibly be renominated for a later Sale.

b. Summary of Impacts: Cancelling the Sale will eliminate all the impacts that are expected to result from the proposal, but not all impacts from oil and gas activity in the Southern California region, since exploration and development is continuing from the previous Sales. Although impacts related to oil spills from the proposal would be eliminated, the continued importation of oil via tankers is expected to result in spills.

Realization of economic or national security benefits resulting from the estimated oil and gas resources would be foregone unless tracts from this Sale were incorporated into a future Sale. Cancelling the Sale would also eliminate all regional increases in economic activity expected to occur as a result of the proposal. The jobs and increases in gross regional product foregone represent a less than 1 percent increase over baseline projections. However, possible stress on communities associated with the Sale-related population growth would not occur if the Sale were cancelled.

4. Alternative 4 - Delay the Sale

a. Description: If the alternative of delaying the Sale is chosen, tracts would be withheld from a Sale offering for a period of time. The period of delay would be governed by the reason for not leasing at the present time. A decision to delay the Sale could be made for any number of reasons: for example, to allow completion of further environmental studies; to allow advancement of deep water technology; or to allow further State and local onshore planning for anticipated effects from offshore oil and gas activities.

b. Summary of Impacts: Postponement of the Sale would result in delay in the exploration, development, and production of Sale No. 68 oil and gas resources. Any economic or national security benefits which could be attributed to the domestic production of hydrocarbons in these amounts would be postponed.

A delay of the Sale may not change any of the impacts assumed to occur under Alternative 1; it would most likely postpone their occurrence. However, improvements may occur in technologies for oil spill prevention and recovery, deep water drilling, or for exploration and production in hostile environments which may lessen the risk of some adverse impacts.

Another reason for delay could be to obtain more environmental information. Important resources in the Southern California area include abundant coastal and pelagic birds and their rookeries, sea mammals, fish, rich coastal ecosystems, and aesthetic values. Studies sponsored by BLM are currently underway to obtain more information regarding distribution, abundance, and behavior of species thought to be sensitive to oil and offshore development and other aspects of OCS leasing. Certain studies will not be completed prior to the final environmental impact statement for this proposal. An option is to delay the Sale until more information becomes available. Information available within 2 years would result from current studies in the Pacific area.

Fiscal year 1981 approved studies, applicable to Southern California include:

- Seabird Oil Spill Behavior Study (year II)
- Characterization of Southern California Offshore Meteorological Patterns
- Santa Barbara Channel Circulation Model
- Oil Toxicity to Selected Commercial and Sport Fish and Shellfish (year II)
- Santa Barbara Channel Marine Mammal and Seabird Risk Analysis
- Inventory and Evaluation of California Coastal Recreation and Aesthetic Resources (year II)
- Santa Barbara Channel Prehistoric Mapping Study

For additional information on studies see Section I.B.4.

The impacts of delaying the Sale for about 2 years would be generally the same as for the proposal. However, enhanced knowledge of the environment and effects of OCS activities might enable better management and regulation of OCS operations. Without a delay of Sale, the studies information will, nevertheless, become available later in the leasing cycle and will be used in evaluating exploration strategies and in developing production plans; thus, delay is likely to merely postpone the action and the expected impacts.

5. Alternative 5 - Other Alternatives: The purpose of this section is to emphasize that the Secretary can choose any combination or partial combination of tracts discussed in the preceding alternatives. For example, the Secretary might choose to delay leasing tracts within the marine sanctuary, but offer the remainder as proposed. The alternatives previously discussed are not intended to represent all possible alternatives to the proposed action.

6. Alternative Energy

a. Energy Sources: It is anticipated that the oil and gas that would become available from this proposal in the next 25-year period could provide a significant contribution to this region's energy supply; if the subject Sale were cancelled, the following energy actions or sources might be used as substitutes:

(1) Energy conservation
(2) Conventional oil and gas supplies
(3) Coal
(4) Nuclear power
(5) Oil shale
(6) Hydroelectric power
(7) Solar energy
(8) Oil imports
(9) Natural gas pipeline imports
(10) Liquified natural gas imports
(11) Geothermal energy
(12) Synthetic fuels
(13) Bioconversion
(14) Other energy sources
(15) Combination of alternatives

This section briefly discusses these alternatives. For more detailed information on each of these energy sources and environmental impacts, refer to the following: 1) Energy Alternatives: A Comparative Analysis, (Univ. of Oklahoma 1975) prepared for BLM by The Science and Public Policy Program of the University of Oklahoma, and 2 through 5 FEISs for Lease Sales 35, 48, 53, and 71.

If this proposal is cancelled, an additive impact of greater oil and gas deficits resulting in increased imports can be expected. If Sales such as this are cancelled, the energy actions or sources shown above might be used as substitutes. Based upon the range of undiscovered resource estimates by the USGS for the proposed Sale area, Table II.B.6-1 presents the energy equivalents which could be required for other energy sources to substitute for this proposed action.

(1) Energy Conservation - Vigorous energy conservation is an alternative that warrants serious consideration. The Project Independence Report of the Federal Energy Administration claims that energy conservation alone can reduce energy demand growth by 0.7 to 1.2 percent depending on the world price of oil.

The residential and commercial sectors of the economy are often characterized as inefficient energy consumers. Excessive consumption is also evident in the industrial sector. Estimated energy savings of between 10 and 30 percent may be available in these sectors of the economy.

TABLE II.B.6-1

ENERGY NEEDED FROM OTHER SOURCES TO REPLACE ANTICIPATED OIL AND GAS PRODUCTION FROM PROPOSED OCS SALE 68

Anticipated Crude Oil Production (Total Risked Mean)	121 million barrels
Anticipated Natural Gas Production (Total Risked Mean)	280 billion cubic feet
Crude Oil Btu Equivalent	677.6 x 10^{12} Btu[a]
Natural Gas Btu Equivalent	285.9 x 12^{12} Btu[b]
Total Oil and Gas Btu Equivalent	963.5 x 10^{12} Btu
Total Oil Import Equivalent	172 million barrels
Total Gas Import Equivalent	944 billion cubic feet
Coal Import Equivalent	40.15 million tons[c]
Coal Gasification (Number Low Btu Plants)	0.24 plants[d]
Oil Shale Equivalent	245.8 million tons[e]
Nuclear Capacity (Number Light Water Reactors 1000 MWe Capacity)	0.73 plants[f]
Total Fuel Loads (Uranium Dioxide)	197.86 tons[g]
Hydroelectric Facilities (200 MWe Capacity)	36.5 plants
Geothermal Facilities (100 MWe Capacity)	73 plants
Solar Energy (Collector Size at 10% Efficiency)	26.1 square miles

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[a] Assuming one barrel of oil equals 5.6 million Btu.

[b] Assuming one cubic foot of natural gas equals 1,021 Btu.

[c] Assuming one ton of coal equals 24 million Btu.

[d] Assuming Koppers-Totzek processing requiring 10,570 tons/day of coal for an output of 250 billion Btu's/day. Also assumes coal of 8,780 Btu's per pound.

[e] Assuming high grade shale recovery of 0.7 barrels per ton of oil shale.

[f] One kilowatt-hour equals 3,412 Btu at a theoretical conversion rate of other energy forms to electricity at 100% efficiency. Capacity is calculated assuming an 80% plant factor and 33% efficiency of fossil fuel electricity generation.

[g] Assuming 30 metric tons enriched U_3O_8 first core fuels, and 10 metric tons enriched U_3O_8 annual reloads with plutonium recycle for each normalized 1,000 MW(e) light water reactor.

Transportation of people and goods accounts for approximately 25 percent of nationwide energy use. Using short- and mid-term conservation measures such as consumer education, lower speed limits, rate and service improvements on public transit and rail freight transit, energy savings of 15 to 25 percent might be achieved.

Significant energy savings are clearly possible through accelerated conservation efforts. The Project Independence Report estimates that conservation alone could result in a 2.2 million barrel per day reduction in petroleum demand by 1985. The environmental impacts of a vigorous energy conservation program will be primarily beneficial. The exact nature and magnitude of these impacts will depend on whether there is a net reduction in energy use or whether the reduction is accomplished through technological change and substitutions.

(2) Conventional Oil and Gas Supplies - Large quantities of oil and gas still remain in the United States. The U.S. Geological Survey (1975) estimates that onshore crude oil measured reserves as of December 31, 1974, were about 31 billion barrels, indicated reserves were 4.33 billion barrels, inferred reserves were 20.4 billion barrels, and undiscovered recoverable resources ranged from 37 billion barrels with a 95 percent probability and 81 billion barrels with a 5 percent probability.

Despite the magnitude of reserves, domestic oil production is likely to continue to decline from its peak production rate attained in 1970. The development of new reserves required to meet gas demand will depend on continued development of onshore areas and of commercially viable nuclear stimulation or massive hydraulic fracturing to produce natural gas from low permeability reservoirs. Additional domestic oil reserves are recoverable through secondary and tertiary extraction techniques. However, the additional oil that is attainable in this manner is in many cases "old" and hence has been subject to price controls. These controls have diminished the incentive for using these sophisticated and expensive recovery methods, but now that they have been removed, there is expected to be more incentive to reopen the "old" wells.

This alternative would entail environmental impacts such as land subsidence, soil sterilization, and disruption of existing land use patterns. Equipment failure, human error, and blowouts may also impair environmental quality. Moreover, poor well construction, particularly in older wells, and oil spills can result in ground and surface water pollution.

The magnitude of these impacts would depend on whether the increased production resulted from improved recovery methods or new discoveries. If improved recovery is realized, the impacts will likely be of little significance and will occur in already developed areas. Should new discoveries be found, the impact will be more significant and disruptive, as the whole new infrastructure would have to be built from the ground up.

(3) Coal - Coal is the most abundance energy resource in the United States. Coal deposits underlying nearly 460,000 square miles in 37 States constitute one-quarter of the known world supply and account for 80 percent of our proven fuel reserves. Proved reserves of coal contain 125 times the energy consumed in 1970.

To replace the energy expected to be realized from the proposed Southern California sale, 40 million tons of coal would be necessary. Though domestic reserves could easily provide this quantity, serious limitations to coal development exist. In many uses, particularly in California, coal is an imperfect substitute for oil or natural gas.

If an alternative to proposed OCS No. 68 is greater reliance on coal, it may be expected that mining would increase in western states to provide the necessary fuel source.

Combustion of coal results in various emissions, notably SO_2 and particulates. If the expected production from this sale is replaced by coal, there will be an increase in these pollutants, especially if coal is substituted for the natural gas presently used.

The five major coal transportation systems (road, rail, water, conveyor, and pipeline) all have some adverse environmental impacts. These include air and noise pollution, safety, land use, trash, disposal, and aesthetics. However, since spill problems are not associated with coal, most of the impacts can be controlled with greater care and consideration.

Technology for conversion of coal into gaseous and liquid hydrocarbons has been established for several decades and a number of relatively low-capacity commercial plants exist in various parts of the world. However, few cost-effective advanced technologies have progressed beyond the pilot plant stage.

Numerous problems remain before commercial development of synthetic fuels from coal can proceed. Specific technical problems must be solved. The cost effectiveness of synthetic fuels from coal will depend on prices of other fuels, primarily oil and natural gas.

(4) Nuclear Power - The predominant nuclear system used in the United States is the uranium dioxide fueled, light water moderated and cooled nuclear power plant. Research and development is being directed toward other types of reactors, notably the breeder reactor and fusion reactors.

Although nuclear plants do not emit particulates or gaseous pollutants from combustion, the potential for serious environmental problems exists. Some airborne and liquid radioactive materials are released to the environment during normal operation. The amounts released are very small and potential exposure has been shown to be less than the average level of natural radiation exposure. The plants are designed and operated in such a way that the probability of harmful radioactivity released from accidents is very low.

This has been seen in Pennsylvania, where the Three-Mile Island Power Plant has been shut down since 1979 due to an accident inside the containment structure. However, even though harmful radioactivity has not been released, and the area has not had to be evacuated, there has been a large increase in public concern for the safety of these power plants, and attempts have been made to stop all future construction, and to shut down all existing nuclear plants. The present dependence on this power source tends to preclude shut down at the present time as no suitable alternative is available at present, and nuclear power is supplying about 10% of commercial electricity in the U.S. Yet, there has been a sharp decline in new plant orders over the past few years, primarily due to the increased plant costs, tighter regulations, and increased public opposition.

Nuclear plants use essentially the same cooling process as fossil-fuel plants and thus share the problem of heat dissipation from cooling water. However, light water reactors require larger amounts of cooling water and discharge greater amounts of waste heat to the water than comparably sized fossil-fuel plants. The effects of thermal discharges may be beneficial in some though not all cases. Adverse effects can often be mitigated by use of cooling ponds or cooling towers.

Low level radioactive wastes from normal operation of a nuclear plant must be collected, placed in protective containers, and shipped to a Federally-licensed storage site and buried. High level wastes created within the fuel elements remain there until the fuel elements are processed. Currently, spent fuel is stored at NRC-licensed facilities. Plans call for recovering unused fuels at reprocessing plants, solidifying the wastes, and placing them in storage at a Federal Repository.

There are also impacts on land, water, and air quality arising from the mining of these uranium ores. Dwindling amounts of high grade reserves will increase the amounts of land mined for lower grade radioactive ores--primarily in western states. The mining operations will be similar to coal, but the nature and distribution of the deposits mean "lesser" impact while radioactive tailings cause unusual problems for disposal, the environment, and human health.

(5) Oil Shale - Large areas of the United States are known to contain oil shale deposits but those in the Green River formation in Colorado, Wyoming, and Utah, have the greatest commercial potential. The oil shale resources of the Green River formation are estimated at 1,781 billion barrels, of which 129 billion barrels are classes one and two resources, 186 billion barrels are class three resources, and 1,466 billion barrels are class four resources.[a]

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[a] U.S. Energy Outlook, National Petroleum Council, Washington, .D.C, 1972, pp. 207-208. Classes one and two deposits are at least 30 feet thick and average 30 gallons of oil per ton of shale, and include only the most accessible and better defined deposits. Class three deposits are as rich as classes one and two but more poorly defined and less favorably located. Class four deposits are lower grade, poorly defined deposits ranging down to 15 gallons of oil per ton of shale.

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To substitute the energy equivalent estimated to be produced from this proposed sale, 246 million tons of oil shale would have to be mined and processed.

Oil shale development poses serious environmental problems. With surface or conventional underground mining, it is very difficult to dispose of the huge quantities of spent shale, which occupy a larger volume than before the oil was extracted. Inducing revegetation in an area of oil shale development is difficult and may take more than ten years. In-place processing avoids many of these environmental hazards. The spent shale problem is much less severe with underground mining.

However, the processing (retorting) operations consume large quantities of water and generate large amounts of waste water. The waste water must be treated and can be reused in the processes. Therefore, it has been assumed that water pollution will not be a problem outside the complex. However, the limited availability of input water in the development area could lead to resource use conflicts.

(6) Hydroelectric Power - Hydropower is energy from falling water, which is used to drive turbines and thus produce electricity. Conventional hydroelectric developments convert the energy of natural regulated stream flows falling from a height to produce electric power. Pumped storage projects generate electric power by releasing water from an upper to a lower storage pool and then pumping the water back to the upper pool for repeated use. A pumped storage project consumes more energy than it generates but converts offpeak, low value energy to high value peak energy.

Many of the major hydroelectric sites operating today were developed in the early 1950's. Thirty to forty years ago hydroelectric plants supplied as much as 30 percent of the electricity produced in the United States. Although hydroplant production has steadily increased, thermal-electric plant production has increased at a faster rate.

The undeveloped potential for hydroelectric generation is about 93,000 MW in the lower 48 states and about 32,000 MW in Alaska. However, it is likely that hydroelectric power will continue to represent a declining percentage of the total U.S. energy mix due to the following: high capital costs, seasonal variations in waterflows, land use conflicts, environmental effects, water use, and flood control constraints. Sites with the greatest production capacity and lowest development costs have already been exploited.

Construction of a hydroelectric dam represents an irreversible commitment of the land resource beneath the dam and lake. Flooding eliminates wildlife habitat and prevents other uses such as agriculture, mining, and free-flowing river recreation. This is an economic cost which can greatly exceed the cost of the dam itself as was seen by one small hydroelectric facility in Pennsylvania which cost $15 million in 1971 for the dam, but relocation and property adjustment added $100 million to the cost of the facility. This does not include the lost value of the wildlife habitat, the crops which could have grown, or the recreational activity in the natural environment. However, recreation will continue in the form of boating after the facility is completed due to the multiple use concept of these facilities.

(7) Solar Energy - Applications of solar energy must take into account the following:

Solar energy is a diffuse, low intensity source.

Its intensity is continuously variable with time of day, weather, and season.

Its availability differs widely between geographic areas.

The total solar energy intercepted by the earth is 5.9 x 10^{17} Btu's per hour. This is reduced by the atmosphere to approximately 2.7 x 10^{17} Btu's per hour which gives an average intensity of 1450 Btu's per square foot per day. This energy, although free, requires conversion to a suitable form. The major constraint on conversion, is the size of the collector required, due to the low efficiency of photovoltaic generators (5-20%). The large required collector area, at present, precludes commercial operation to replace the proposed sale. However, as a method of space heating, and water heating, it is extremely applicable, and the installation of solar heating to residential buildings is becoming more prevalent. Certain areas require solar energy to be utilized in all new buildings, and more industries are utilizing this as a supplemental energy source.

Solar energy also includes wind energy and ocean thermal energy. Of these, wind energy conversion is being utilized on small scale operations at present, with utility companies having test sites at various locations. These units are dependent on the wind, and as such provide an intermittent power source with a maximum efficiency of 40% energy recovery. The estimated power output of a wind grid system is 40 MWe per square mile, and as such a total area of 182.5 square miles would be required to replace the energy from this proposed Sale.

Ocean thermal energy is still in the experimental development stage, although the Department of Energy estimates that by the year 2000, ocean thermal energy conversion could replace 400,000 barrels of oil a day which is equivalent to a power generation of 93 MWe. This system has been successfully tested on a small scale off Hawaii, and full commercial development still remains to be seen.

(8) Oil Imports - U.S. reliance on imported oil has increased steadily in the last decade. Competition on the world market and recent cutbacks in Middle Eastern oil exports have raised concerns about availability of

oil imports in the future. Declining resource availability and increasing domestic demand restrict potential imports from the Western Hemisphere nations, particularly Venezuela and Canada. Increasing imports from the Middle East brings problems of stability of supply, balance of payments, and U.S. off-loading capacity.

In addition there is increased concern over the political situation in the Middle East. Political disruption can have a drastic effect on oil production, as has been seen in the Iranian-Iraqi war.

In addition to these problems in obtaining oil from foreign sources, one must also consider the potential impact from tanker casualties, which could be on par with the breakup of the "Torrey Canyon" or the "Amoco Cadiz."

In February, 1977, U.S. imports of petroleum and petroleum products were 7,724,000 barrels/day. This has dropped to about 6,000,000 barrels per day in March, 1981. The proposed Sale would replace 0.3 percent of these imports, at the March 1981 level. This is a small increase when compared directly to the total, but it would require one tanker the size of the Amoco Cadiz making delivery once a month for the expected field life to match the production, with all the associated potential impacts.

On a more subtle level, political alignments and policies of the United States could become tied to those of foreign oil powers. This option is the least acceptable for continued American energy independence.

(9) Natural Gas Imports - Imports of natural gas via pipeline have come largely from Canada, with small amounts from Mexico. In 1973, net pipeline imports from Canada were 1,028 bcf, about 4.6 percent of total natural gas used in the United States. These imports were about 33 percent of Canada's natural gas production. Natural gas pipeline imports from Mexico have not been a significant part of U.S. supply. In 1973, imports from Mexico were 1.6 bcf, then in 1978 Mexico announced plans to use all their gas internally. However, due to recent enthusiasm over Mexican hydrocarbons, it is foreseeable that Mexico could supply about 5% of the U.S. consumption. In order to replace the expected production from the proposed Sale, it would be necessary to import an additional 4.2 bcf per year through the existing sources.

As with imports of oil, California could become dependent on foreign control of supply. Fluctuations of that supply could influence quality of life, productivity, and employment. American policies could also become influenced by decisions of foreign gas producers, much as they could under the option of increasing oil imports.

(10) Liquified Natural Gas Imports - The growing shortage of domestic natural gas has encouraged projects to import liquified natural gas (LNG) under long-term contract. Large scale shipping of LNG is a relatively new industry. Several LNG projects are now under consideration on the Pacific, Atlantic, and Gulf coasts.

The potential impacts of LNG imports arise from tankers, terminals, transfer, regasification facilities, and transportation of gas. The primary hazard of handling LNG is the possibility of a fire or explosion during transportation, transfer or storage.

Receiving and regasification facilities will require prime shoreline locations and dredging of channels.

As with importing oil and natural gas, the importation of LNG will put the U.S. in a more dependent position on foreign powers, which is unacceptable for continuous American energy independence.

(11) Geothermal Energy - Geothermal energy is primarily heat energy from the interior of the earth. It may be generated by radioactive decay of elements such as uranium or thorium, and friction due to tidal or crustal plate motions.

There are four major types of geothermal systems: hot water, vapor dominated, geopressured reservoirs, and hot dry rock systems.

In addition to electricity, geothermal energy can offer a potential for space heating, industrial processing, and other nonelectric uses in many areas which presently are highly dependent upon oil and gas for energy needs. However, geothermal electric generating plants are smaller than conventional plants and require a greater amount of steam to generate the same amount of energy. The average output of a plant is on the order of 100 MWe, and as such there would need to be 73 plants to replace the potential energy for Sale No. 68.

A number of gases are associated with geothermal systems and may pose health and pollution problems. However, adverse air quality impacts are generally less than those associated with fossil-fuel plants. Also associated with geothermal energy systems are saline waters which must be disposed of and isolated from contact with ground water regimes.

Land quality problems stem from disturbance due to construction of related facilities, and possible ground subsidence which, in turn, can cause structural failures and loss of groundwater storage capacity.

(12) Synthetic Fuels - Synthetic fuels and oils are primarily a product of coal liquifaction, as stated in Section II.B.6.a.3. Numerous plants for synthesis of liquid fuels have been built in various parts of the world. South Africa in 1955, built a plant with a capacity of 5 million tons per year, and an output of approximately 15 million barrels per year. Another larger plant is expected to be on line in the early 1980s, and at that point oil from coal will account for 35 to 50 percent of South Africa's total petroleum consumption. In the U.S., the process is still primarily in the development stages, due to the low cost of petroleum over the past years, but interest is growing, due to the increase in price of natural crude. This has been shown in 1979 when the Department

of Energy allocated 11.5 percent of its budget to coal gasification and liquifaction. Synthetic fuels could replace the production of Sale 68, but there would be a requirement of building plants capable of handling 2.3 million tons of coal per year.

(13) Bioconversion - Bioconversion is the process of transforming biomass into usable energy. Three methods of conversion are, 1) the conversion into liquid form, 2) the conversion of organic waste into methane gas by bacterial breakdown of the biomass, and 3) the direct burning of source.

The first method mentioned is the conversion to a liquid form, primarily alcohol. This can either be mixed with gasoline to produce gasohol, a product already in widespread use, (the State of California has converted its vehicles over to this power source) or the alcohol can be burned directly in the vehicles. Brazil has replaced 20% of its gasoline with alcohol derived from plant matter.

The second method, the use of bacteria, is already in use on small scale in the U.S. An example is the Hyperion Sewage Treatment Plant in Los Angeles which uses produced methane to run the plant, and sells the excess to a municipal electrical generating plant.

The outputs available for these methods depend upon the material used in the process, and the particular process employed. Hydrogenation to oil produces a net yield of 1.25 barrels per ton, fermentation to produce alcohol will produce 3.7 barrels per ton of sugar, and the bacterial decay will produce an estimated 10,000 cubic feet of methane per ton of organic material. These sources could be used to replace part of the proposed output of Sale No. 68, at present, but would require large increase in plants to replace the entire sale output.

(14) Other Energy Sources - The high cost and rapidly shrinking reserves of the traditional energy fuels have encouraged research into new and different sources for potential energy. Some of these alternate sources have been known for decades but high costs and technical problems have prevented their widespread use. They include tidal power, wave power, and organic fuels, among others.

Environmental impacts of these alternatives are difficult to assess, especially as a great amount of research and development remains to be completed before operational scale systems can be developed, tested, and evaluated for production and application.

The date of commercial availability of such alternatives will depend on the cost of the traditional energy fuels, the level of Federally subsidized research, and the solution of engineering and technical problems.

(15) Combination of Alternatives - Within California, a combination of some of the most viable energy sources available to this area, discussed above, could be utilized to attain an energy equivalent comparable to

that estimated to be produced within the 25-year field life anticipated by this proposed action. However, this combination of alternatives, in order to attain the needed energy mix peculiar to the infrastructure of this area, would have to consist of energy sources attainable now or within the 25-year timeframe that are transferable to the technology presently used, i.e., viable substitues would have to be available for the petroleum and natural gas required by the petrochemical industrial complex, the petroleum used for the transportation sector, and the electricity and fuels used in the Southern California residential and commercial sectors.

b. Non-Energy Uses: The petrochemical industry has been virtually ignored as a use for the oil and gas production of the proposed sale. This, however, is a very important part of the economy with value of product sales on a par with those of oil refineries, and employment of approximately four times that of the oil refineries. The petrochemical industry is based on the processing of raw hydrocarbons to form olefins and aromatics, which allow the manufacture of intermediary products in the formation of various petrochemicals and polymers. These polymers which include plastics such as polyethylene, polypropylene, and polyvinyl chloride, as well as polyester and acrylic fiber such as rayon, are used as with the petrochemicals, to make a wide variety of products, including paint, carpeting, upholstery materials, textiles, rubber, molded and extruded plastic products, fertilizers, medicinal salves, creams and ointments, soaps, and various waxes, and countless other products.

If the proposed sale is canceled, in addition to finding alternative energy sources, there will also be a great need to find alternative sources for all the petrochemical products which would have been available from the recovered resources of the sale area.

c. Summary: In the interest of clarity of presentation, this section has discussed separately each potential alternative form of energy as a possible substitute to the proposed sale. However, it is unlikely that there will ever be a single definitive choice between energy sources, or that development of one source will preclude development of others. Different energy sources will differ in their rate of development and the extent of their contribution to total U.S. energy supplies. Understanding of the extent to which they may replace or complement offshore oil and gas requires reference to the total national energy picture.

The most viable domestically available energy alternatives for the California region, technologies and economies allowing, probably would consist of the use of coal (for use in coal-fired power plants), coal gasification plants (to provide synthetic natural gas), nuclear power and solar energy (to provide energy for space heating), and oil shale processing (to provide petroleum), in addition to conventional oil and gas resources.

Of the foregoing, increased domestic oil and gas production offers considerable possibilities, although adequate incentive must exist for indicated and undiscovered domestic resources to be discovered and extracted.

The acceptability of oil and gas imports as an alternative is diminished by:

- The security risks inherent in placing reliance for essential energy supplies on sources which have demonstrated themselves to be politically unstable and prone to use interruption of petroleum supplies to exert economic and political pressure on their customers.

- The aggravation of unfavorable international trade and payments balances which would accompany substantial increase in oil and gas imports.

- Apparent high costs of liquefying and transporting natural gas other than overland by pipeline.

The non-energy uses of petroleum pose a greater problem in terms of finding alternative sources. Many of the petrochemicals at present have no other source than petroleum, and these would have to be synthesized from entirely different sources if oil shale replacement was not possible. Others, however, are capable of being porduced from other sources such as coal.

7. Comparison of Alternatives: Sections II.B.1, 2, 3 and 4 clearly present the differences in expected benefits and impacts between the five alternatives. The purpose of this section is to focus attention on the significant differences and similarities among impacts and alternatives in comparison with the proposed action (Alternative 1).

Alternative 2: (Reduce Potential Conflict with the Channel Islands National Marine Sanctuary) would delete 13 complete and 24 partial tracts within the Channel Islands National Marine Sanctuary (Figure II.B.2-1). The adoption of this alternative would reduce the estimated mean risked oil and gas resource for the proposal by less than 3 percent. While negligible oil and gas resources would be foregone by deleting the tracts within the marine sanctuary, the adoption of this alternative could significantly reduce the impacts to many sensitive resources of this area.

Deleting the tracts within 6 nm of the islands will increase the time required for spilled oil to reach shore by at least 4 to 5 hours, possibly by as much as 10 hours. During this time, a significant amount of evaporation, dissolution and weathering of the oil would occur, reducing the quantity and toxicity. Also, it would allow more time for oil spill cleanup and containment equipment to be mobilized. With this additional time, the chances of effectively protecting sensitive marine resources are greatly increased. Specifically, the sensitive intertidal and nearshore subtidal resources and the pinniped and seabird resources would be less likely to be directly contacted by the oil.

Increasing the distance between OCS development and these resources would also reduce the vessel traffic, human intrusion and noise generated during exploration and development. Potential disruption of critical breeding and nesting activities for seabirds and pinnipeds would, therefore, be reduced. Also, the risk of damage from platforms and pipelines, to hard bottom subtidal areas would be eliminated. Additionally, deleterious effects from drilling muds, cuttings and formation water would be greatly reduced.

Potential impacts to recreational boating, fishing and diving within the Sanctuary will be reduced and cultural resources will not be subjected to the possible impacts of exploration and development activities.

The reader should note that the Channel Island's unusual and valuable resources (intertidal, subtidal benthos, pinnipeds, seabirds, recreational and cultural) were major reasons the area was designated as a National Marine Sanctuary and a National Park. Adopting Alternative 2 (deleting tracts within the Sanctuary) would be a valuable step in maintaining the characteristics and qualities that were prime reasons for designating the Northern Channel Islands a National Marine Sanctuary and a National Park.

Alternative 3: (Cancel the Sale) could pose potentially adverse impacts on the national economy by perpetual dependence on imported oil and gas. Potential impacts could result from alternative energy sources developed in lieu of this proposal.

Activities associated with the proposal would not occur if this alternative is adopted. All potential physical and biological impacts arising from the discharge of drilling muds, cuttings, formation water and sewage, and those impacts resulting from population shifts or the placement of rigs, pipelines, and related structures, as discussed in Section IV, would be eliminated.

Cancellation of the proposal will not preclude all oil and gas activity in the Southern California Bight. Exploration and development will continue as a result of the 1966 and 1968 Sale and Sale Nos. 35 and 48, and, where commercial discoveries are made, production activities could result. In addition, other California Sales are included on the 5-Year Leasing Schedule and tracts in the Southern California region could be included in these proposals.

Alternative 4: (Delay the Sale) would delay exploration, development, and production of Sale No. 68 oil and gas resources. Any economic or national security benefits which could be attributed to the domestic production of hydrocarbons in these amounts would be postponed.

A delay in the Sale may not change any of the impacts assumed to occur under this proposal (Alternative 1), but would most likely postpone their occurrence. However, improvements may occur in technologies for oil spill prevention and recovery, deep water drilling, or for exploration and production in hostile environments that may lessen the risk of impacts.

CHAPTER III

III. AFFECTED ENVIRONMENT

A. Physical Environment

1. Geology

a. Geologic Description: Tracts recommended for inclusion in OCS Lease Sale No. 68 lie in the offshore portion of the structurally complex part of Southern California that includes the western Transverse Range province and the northern Peninsular Range province shown in Figure III.A.1.a-1. The offshore portion of this latter region, characterized by the highly irregular topography of basins and ridges, is commonly referred to as the Southern California continental borderland. The northern Channel Islands are along the boundary between the two physiographic provinces.

The Santa Barbara basin is the submerged southwestern part of the Transverse Range province (Figure III.A.1.a-1; Vedder, et al. 1969). This trend is commonly referred to as the Santa Barbara Channel. The Channel extends 130 km along its east-west axis and is 40 km wide. Maximum water depth in the Channel is about 625 m.

The characteristic west-trending structural grain of the Transverse Range province (transverse to the distinct north-northwest structural grain of California) is reflected in the major structures within the Santa Barbara basin (Figure III.A.1.a-1). The major structures in the Santa Barbara Channel region are east-west oriented folds and faults. Exemplifying these are the Rincon trend, the Santa Ynez, Pitas Point, and Oak Ridge faults, and the Santa Rosa Island/Santa Cruz Island/Malibu Coast fault zone, which marks the southern boundary of the basin. This structural grain may be superimposed on a northwest trend in older, buried structures (Howell, et al. 1978).

The basin floor is composed of Quaternary sediments, as much as 2000 m thick, that are gently folded and faulted in most areas but are undeformed in many others (Curran, et al. 1971; Vedder and others, 1974). The shelves and slopes of the basin, although barren of sediment in places, are generally mantled by a very thin layer of sediment. Bottom sediments in the central part of the basin are predominantly mud.

Below the Quaternary-aged basin fill are more than 15,000 m of highly folded and faulted Tertiary and Cretaceous strata (Figure III.A.1.a-2; Vedder, et al. 1969).

The area south of the Channel Islands, the Southern California continental borderland, forms the north and west offshore extension of the Peninsular Range province. This area is characterized by a series of complexly folded and faulted north-northwest-trending ridges and basins that parallel the structural grain of the onshore Peninsular Range province (Figure III.A.1.a-1). The basins are under water depths of 600-2000 m, whereas water depths above the flat-topped ridges and coastal shelves are usually less than 150 m.

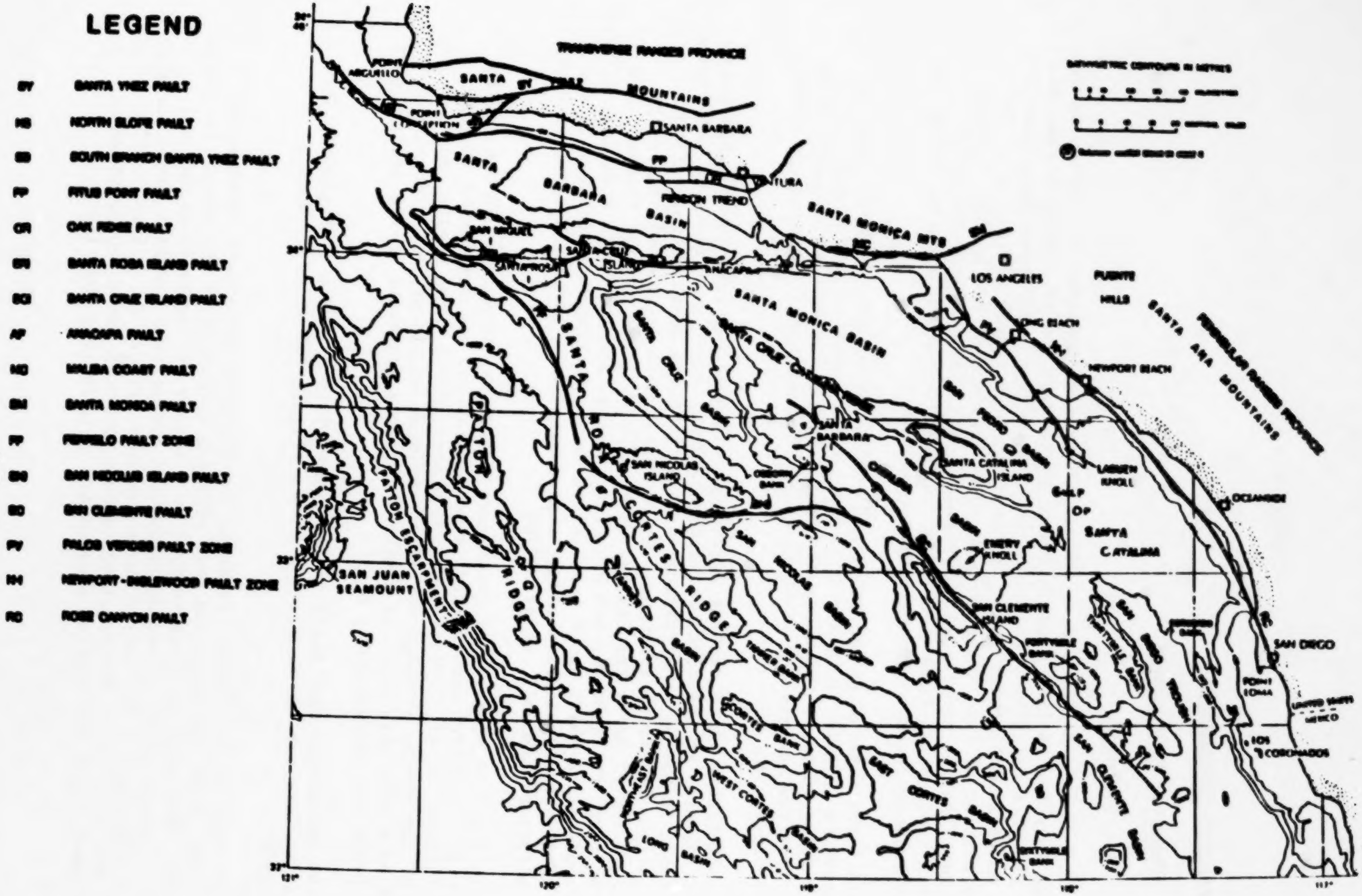
LEGEND
SY SANTA YNEZ FAULT
NS NORTH SLOPE FAULT
SB SOUTH BRANCH SANTA YNEZ FAULT
PP PITAS POINT FAULT
OR OAK RIDGE FAULT
SR SANTA ROSA ISLAND FAULT
SCI SANTA CRUZ ISLAND FAULT
AF ANACAPA FAULT
MC MALIBU COAST FAULT
SM SANTA MONICA FAULT
FP FERRELO FAULT ZONE
SN SAN NICOLAS ISLAND FAULT
SC SAN CLEMENTE FAULT
PV PALOS VERDES FAULT ZONE
NI NEWPORT-INGLEWOOD FAULT ZONE
RC ROSE CANYON FAULT
TRANSVERSE RANGES PROVINCE
SANTA YNEZ MOUNTAINS
POINT ARGUELLO
POINT CONCEPTION
SANTA BARBARA
SANTA BARBARA BASIN
VENTURA
RINCON TREND
SANTA MONICA MTS
SAN MIGUEL
SANTA ROSA
SANTA CRUZ ISLAND
ANACAPA
LOS ANGELES
PUENTE HILLS
SANTA ANA MOUNTAINS
PENINSULAR RANGES PROVINCE
LONG BEACH
NEWPORT BEACH
SANTA MONICA BASIN
SANTA CRUZ BASIN
SAN PEDRO BASIN
SANTA BARBARA
SAN NICOLAS ISLAND
SANTA CATALINA ISLAND
CATALINA BASIN
LASUEN KNOLL
GULF OF SANTA CATALINA
OCEANSIDE
EMERY KNOLL
SAN CLEMENTE ISLAND
SAN NICOLAS BASIN
SAN DIEGO TROUGH
SAN DIEGO
POINT LOMA
UNITED STATES
MEXICO
LOS CORONADOS
CORTES RIDGE
CORTES BANK
EAST CORTES BASIN
WEST CORTES BASIN
LONG BASIN
SAN CLEMENTE BASIN
PATTON RIDGE
PATTON ESCARPMENT
SAN JUAN SEAMOUNT
BATHYMETRIC CONTOURS IN METERS
34° 40'
34°
33°
32°
121°
120°
119°
118°
117°

Figure III.A.1.a-1 Index Map of the Southern California Continental Borderland Showing Locations of Faults

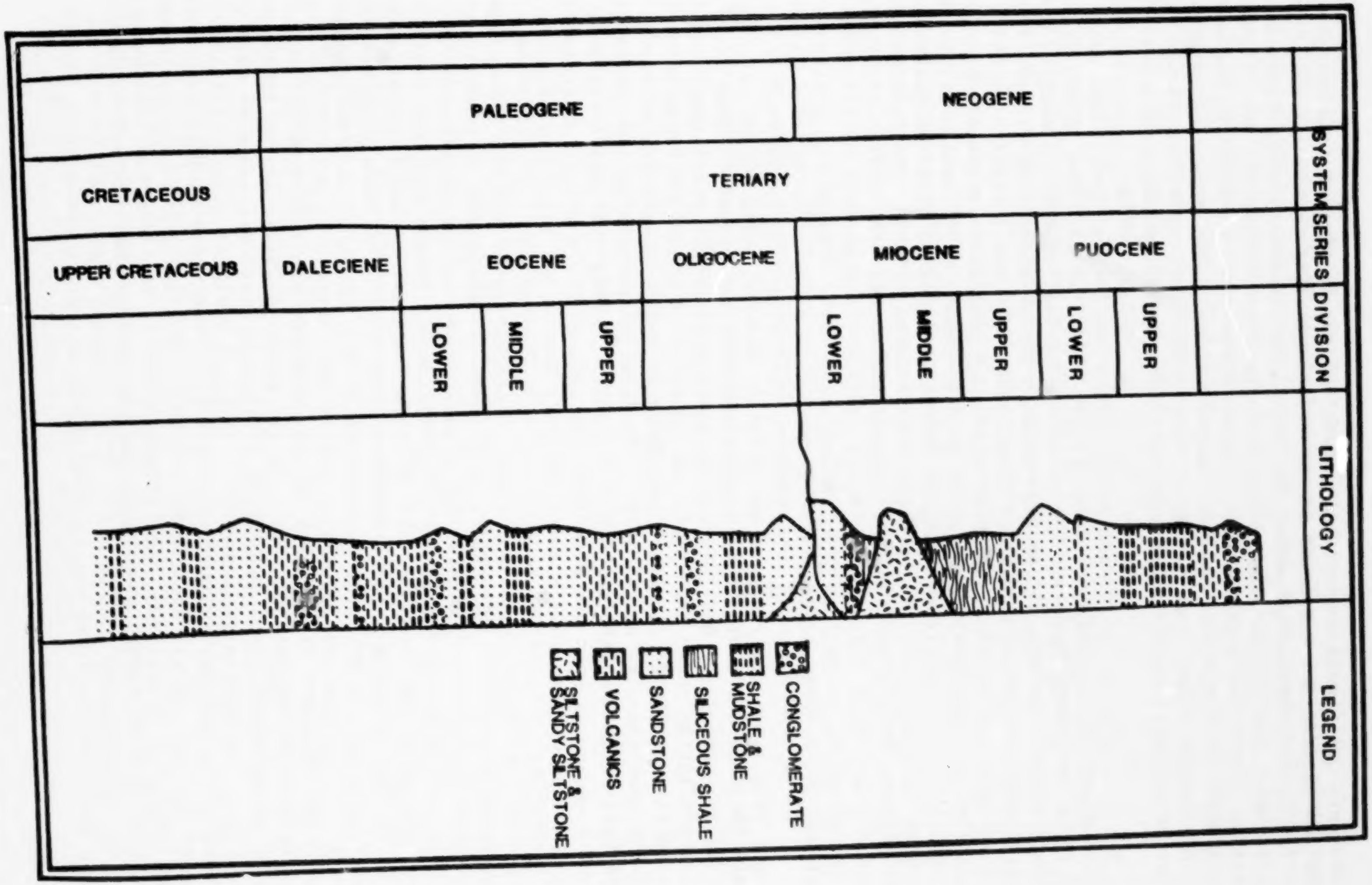
SYSTEM
SERIES
DIVISION
LITHOLOGY
LEGEND
PALEOGENE
NEOGENE
CRETACEOUS
TERIARY
UPPER CRETACEOUS
DALECIENE
EOCENE
OLIGOCENE
MIOCENE
PUOCENE
LOWER
MIDDLE
UPPER
LOWER
MIDDLE
UPPER
LOWER
UPPER
CONGLOMERATE
SHALE & MUDSTONE
SILICEOUS SHALE
SANDSTONE
VOLCANICS
SILTSTONE & SANDY SILTSTONE

Figure III.A.1.a-2 Generalized Stratigraphic Column for Sale No. 68 Area

The Southern California continental borderland may be divided into the inner basins and ridges, and the outer basins and ridges (Figure III.A.1.a-1). The inner basins are the Santa Monica, San Pedro, and Catalina basins, and the San Diego trough. Two of them, Santa Monica Bay and San Pedro Bay, are offshore extensions of the Los Angeles basin. Inner ridges are the Palos Verdes uplift and the Santa Cruz-Catalina and San Clemente Ridges. The outer basins are Santa Cruz, San Nicolas, San Clemente, East Cortes, West Cortes, Velero, Long, Tanner, and Patton basins. Outer ridges are Santa Rosa-Cortes and Patton Ridges.

Rocks and sediments in the Southern California continental borderland range in age from Cretaceous through Holocene (Figure III.A.1.a-2). The outer ridges are uplifts of pre-Tertiary rocks with an on-lapping sequence of Neogene sandstone and shale. The Santa Rosa-Cortes Ridge is the expression of up-folded Paleogene and cretaceous deep-water trough sediments and turbidites. The outer ridges are sites of erosion, whereas, the outer basins are sites of deposition. Sediments of late Tertiary to Quaternary age, consisting of sand, mud, or shell hash, are sparse on the ridge tops and generally occur in isolated pockets 5-20 m thick (Greene, et al. 1975; Field and Richmond, 1980). The westernmost basins contain as much as 3000 m of Neogene sediments. The basins adjoining the Santa Rosa-Cortes Ridge on the east, contain thick secions of Paleogene and Neogene sediments, as well as Mid-Tertiary volcanics. Quaternary sediments are as much as 1200 m thick in the outer basins.

The inner ridges are comprised of metamorphic basement rocks (Catalina schist) that are intruded and overlain by Neogene plutonic and volcanic rocks (Howell, et al. 1978). Overlying and buttressing these metamorphic and igneous units are Neogene clastic rocks (sandstone and shale). Paleogene or Cretaceous siltstone, sandstone, and conglomerate are found at the southeast end of Santa Catalina Island (Howell, et al. 1978). The coastal shelves consist mainly of tightly folded late Neogene sandstone and shale. Along the coastal shelves, Quaternary sands and muds are extensive, as much as 200 m thick. Correlative deposits are as much as 2000 m thick in Santa Monica and San Pedro basins.

b. Geohazards (General): Instability of the sea floor, whether from seismic activity or sedimentary processes, is recognized as the principal hazard to emplacement of platforms and pipelines in the marine environment. Hazards related directly to seismic activity include ground shaking, fault rupture, generation of tsunamis, and earthquake-induced ground failures such as liquefaction and slumping. Faults showing displacement of either the sea floor or young (less than 11,000 years) sediments as well as those associated with historical earthquakes are considered active and, therefore, potentially hazardous to development. Instability of the sea floor can also result from dynamic (e.g., wave surge) and static (e.g., gravity) forces acting independently of seismic activity. Some areas of the sea floor are prone to mass movement (e.g., slumps, slides) or other forms of sediment transport (flows, creep, or current scour). Submarine canyon walls and steep slopes, especially those with sediment cover, are considered to be hazardous. Oil and gas seeps, while not inherently hazardous, may provide clues to the location of fractured reservoir rocks and shallow over-pressured gas pockets that can pose a danger to drilling operations.

Hazards, as discussed above, pose a danger to pipelines (onshore and offshore), platforms, refineries and other oil and gas development support facilities. The conditions and processes of greatest concern are those that could result in a large oil spill and the attendant conditions that could delay control and cleanup or make them ineffective. The potential for damage from different kinds of natural events varies from area to area; thus, it is not possible to specify all possible conditions when dealing with geologic hazards and seismic conditions on a regional scale.

Seismicity and Faulting. High seismicity characterizes all of the California coastal region. Earthquakes in the Borderland have been monitored since the 1920s. More than 20 earthquakes of magnitude 6.0 or greater have occurred in Southern California since 1912. The largest earthquake centered in offshore Southern California, magnitude 7.5, occurred west of Point Arguello in 1927 (Hamilton, et al. 1969). Epicenters of the major earthquakes in Southern California during 1900-1974 are plotted on the Geological Hazards Visual, which shows events greater than or equal to magnitude 4. Because Tanner and Cortes Banks lie beyond the limits of the seismographic network, there are no reliable epicenter data.

Offshore Southern California is cut by numerous faults, many of which are identified as active (Geological Hazards Visual, Figure III.A.1.a-1).

In the Channel Islands area, the Santa Rosa Island, Santa Cruz Island, and Malibu Coast faults and their eastern extensions form a complex zone in which reverse slip accompanied by left-lateral strike slip has occurred throughout the Quaternary (U.S. Geological Survey, 1976). In the Southern California Continental Borderland to the south, the predominant fault trend is northwest, and several lines of evidence suggest that right-lateral strike slip predominates.

Four major active fault zones transect the inner basin and ridge area; these are the Palos Verdes, Malibu Coast, Newport-Inglewood, and Rose Canyon fault zones (fig. 1). Many smaller faults associated with these zones may be active (Ziony and others, 1974; Jennings, 1975; Richmond and others, in prep.). The most significant of these faults are the Palos Verdes and Newport-Inglewood fault zones. Faults in these zones show large vertical and horizontal displacements and have long histories of seismic activity that extend to the present time.

The longest Quaternary fault mapped in the inner basin and ridge area is the San Clemente fault extending more than 100 km. Several earthquakes have been reported in the vicinity of this fault (Hileman, et al. 1973).

Two major fault zones transect the outer basin and ridge area; these are the Ferrelo and "San Nicolas" fault zones (Figure III.A.1.a-1). The Ferrelo fault zone along the west flank of the northern Santa Rosa-Cortes Ridge may extend as far south as Cortes Bank and offsets Quaternary sediments and the seafloor along most of its length (Junger, 1979; Field and Richmond, 1980). The "San Nicolas" fault zone, along the south flank of the San Nicolas Island platform is not well known but shows some sea-floor offsets along its western extension. In the Tanner-Cortes Banks area, many faults displace either Holocene sediment or the sea-floor (Richmond, et al. in prep.).

In the Santa Barbara Channel region, major faults include the South Branch Santa Ynez, Pitas Point, Oak Ridge, "northern Santa Barbara slope," Santa Cruz Island, and Santa Rosa Island faults (Figure III.A.1.a-1). Several of these faults are considered capable of generating large magnitude earthquakes (U.S. Geological Survey, 1976; Yerkes and others, 1980).

Sea-Floor Instability. Evidence of sediment failure resulting in downslope mass movement (slump, slides, and creep) is common throughout the Borderland (Geological Hazards Visual). Other forms of failure (for example, liquefaction) are difficult to detect and it has not been possible to determine their prevalence. Many conditions giving rise to sea-floor instability are characteristic of the Borderland; among these are localized thick accumulations of unconsolidated, water-saturated sediment, steep slopes, and seismic and storm activity (Field and Edwards, 1980).

In the Santa Barbara Channel, submarine slumps and slides are most common along the northern slope, especially between Point Conception and Goleta Point, but are present locally along basin slopes and canyon walls throughout the area (Geological Hazards Visual; U.S. Geological Survey, 1976; Richmond, et al. in prep.). In addition, buried disturbed strata suggestive of past submarine sliding have been noted in seismic profiles across the base of the Channel Islands platform (U.S. Geological Survey, 1976). Farther south along the mainland shelf, prominent submarine slumps are present in Hueneme Canyon, along the slope seaward of the Oxnard shelf, in Santa Monica Canyon, on the slope seaward of Point Fermin (San Pedro shelf), and along the east slope of the San Diego Trough (Geological Hazards Visual; Greene, et al. 1975; Greene, 1976; Field and Edwards, 1980; Richmond, et al. in prep.).

Evidence of sea-floor failure is common on slopes in the outer Borderland (Geological Hazards Visual). Slump deposits have been identified along the northern Santa Rosa-Cortes Ridge, east of San Nicolas Island, and on the flanks of Tanner and Cortes Banks, and in the Santa Cruz basin (Greene, et al. 1975; Field, et al. 1977; Field and Richmond, 1980; Field and Edwards, 1980). These slumps range in size from tens of meters to as much as 9 km on a side and are found on mid- to lower-slopes at water depths of 500 to 1000 m. The location of related scarps and thickness of these deposits (< 50 m) suggest that most of these failures occurred at the shelf (or ridge) edge or on the upper slope. The relative importance of earthquakes, gravitational loading, and dynamic loading from storm waves in triggering these and other sea-floor failures in the Borderland is not known.

Oil and Gas Seeps. Most documented natural hydrocarbon seeps identified in the borderland are located in the Santa Barbara Channel and on the Santa Monica and San Pedro Shelves (Shallow Oil and Gas Visual). Seeps have been reported in the Santa Barbara Channel by Wilkinson (1971) and Fischer (1975). Fischer and Stevenson (1973) mapped more than 900 seeps in a 7-mile area off

Point Conception. Oil and gas seeps are present in Santa Monica and San Pedro Bays mostly along the traces of the Malibu Coast and Palos Verdes faults (Wilkinson, 1971; Greene, et al. 1975) and offshore between Point Vicente and Point Fermin (Wilkinson, 1971). Many water-column anomalies have been mapped from high-resolution geophysical data from San Pedro Bay and along the entire length of the Santa Rosa-Cortes Ridge by Greene, et al. (1975) and Richmond and others (in prep.), but have not been documented as oil or gas seeps (Shallow Oil and Gas Visual). However, the presence of hydrocarbons in sediment samples and the large number of faults in the area suggest that surface seeps may be present (Howell, et al. 1978).

A general pattern of diminishing seep activity with time (1946-1972) has been identified in the Santa Barbara Channel (Fischer and Stevenson, 1973). It is postulated that this declining seep activity may be directly related to increased production of hydrocarbons with resultant pressure declines. In localized examples, however, seep activity may actually be intensified during production due to artificial stimulation by such secondary recovery practices as repressuring of reservoirs (Fischer and Berry).

Shallow Gas. Shallow gas deposits refer to confined gas accumulations with possible abnormal pore pressures. Bright reflectors on high-resolution seismic reflection profiles, a possible indication of shallow gas in sediments, were mapped by Richmond and others (in prep.) in the tracts offered in OCS Lease Sale No. 48 (Shallow Oil and Gas). These zones occur almost exclusively in Pliocene and Pleistocene rocks in the Santa Barbara Basin and along the coastal shelf from Palos Verdes to the Mexican Border. Shallow gas zones are as much as 400 sq km in area and range from 50 to 400 m below the seafloor. Possible shallow gas zones are rare on the outer ridges. Highly pressurized shallow gas zones that are penetrated during drilling operations can result in a blowout. The shallower gas zones can contribute to the instability of a section by effectively lowering the shear strength of the sediment. Shallow gas is not a documented constraint to development in Southern California.

Tsunamis. Locally generated tsunamis have been recorded along the coast between Point Conception and the Mexican Border; however, these are few in number and have not caused major damage. The largest tsunami ever reported in California followed the 1812 Santa Barbara earthquake and had wave runup of about 15 m above sea level just west of Santa Barbara (U.S. Geological Survey, 1976). The remaining tsunamis occurred in 1879 at Santa Monica and in 1925 and 1933 at Long Beach (Iida and others, 1967). The 1933 tsunami resulted from the March 10, 1933, Long Beach earthquake.

c. Non-Petroleum Mineral Resources: The most exploitable non-petroleum minerals on the Southern California OCS at present are sand and gravel and phosphorite.

The Southern California Borderland has a narrow continental shelf; but offshore ridges, troughs, and banks provide numerous additional sites for sand and gravel accumulation that are well within the working limit of existing dredges.

Vast quantities of sand blanket much of the shelf area within the Southern California Borderland. Relict deposits of gravel are present in significant amounts on the San Pedro shelf, Santa Monica shelf, and San Diego shelf west of Imperial Beach and seaward to the Coronado Escarpment. Extensive shell deposits, which could serve as a source of lime for concrete, encircle Santa Cruz, Santa Rosa, and San Miguel Islands. Estimates show approximately 20 to 120 million cubic meters of gravel, 64 to 320 million cubic meters of coarse sand, 880 to 4400 million cubic meters of medium sand, and 160 to 820 million cubic meters of shell on the mainland shelf from Point Conception to the United States-Mexican Border and on the northern shelf areas of Anacapa, Santa Cruz, Santa Rosa, and San Miguel Islands.

Another vast sand resource is the >95-percent-pure calcium carbonate sands occurring on the Cortes Bank, in the Southern California Outer Channel Islands area, where the bank is covered by at least a 1-to-2 meter veneer of such sand. The commercial value of carbonate sands increases exponentially with each percentage point of $CaCo_3$ content over 95 percent, thus the Cortes Bank material would carry a high value.

Industry has previously investigated a large gravel deposit, partly covered by fine sand, which lies near San Diego on both State and Federal OCS lands, parallel to the offshore boundary with Mexico. This deposit alone, in Federal and State waters, contains about 200 million cubic meters of gravel, a volume which may be compared with an annual consumption rate of 30 million cubic meters for the greater Los Angeles area.

Southern California marine phosphorite nodules are hard, dense masses varying in size from boulders to silts, and average 28 percent P_2O_5. The deposits accumulate on submarine banks (e.g., Forty Mile Bank) in areas of upwelling. Water depths average over 200 meters.

Sampling of marine phosphorites of the Southern California Borderland has been primarily limited to surficial dredging of sediments and rock. Consequently, resource estimates are judged to be on the conservative side and may represent only a fraction of the actual phosphorite potential of the area. Assuming a limited deposit thickness, estimates indicate a resource of approximately 65 million metric tons of phosphate nodules and 52 million metric tons of phosphatic sand.

2. Physical and Chemical Oceanography

a. Physical Oceanography: Physical oceanography of the Southern California Bight previously has been discussed in detail in the Final Environmental Impact Statement for OCS Sale No. 48 (Vol. 1). CALCOFI has continued research cruises in the area accumulating more data on physical and chemical parameters and several summaries of existing oceanographic data are nearing completion (NOAA/EDIS Climatology and Oceanographic Analysis of the California Pacific Outer Continental Shelf Region, 1980; Jones and Stokes, Ecological Characterization of Central and Northern California 1980). These provide no new information on physical processes in the marine environment and emphasize again the lack of quantitative nearshore data collected over extended periods of time. To increase the knowledge of physical oceanography, circulation studies are planned by BLM for the Santa Barbara Channel and elsewhere in California. The Coastal Ocean Dynamics Experiment (CODE) being started in Northern California will involve current measurements which will add to our knowledge of nearshore processes.

Recent analyses of CALCOFI data on long-term Pacific temperature and salinity anomalies indicate that the forces driving and affecting the California currents are complex and that patterns which we see on short-term scales may not hold for longer scales. Meandering of the western edge of the California Current, incursion of warm high-salinity tropical waters into Southern California, and offshore upwelling events which are driven by distant meteorological patterns are only now being addressed. It remains to be seen whether an understanding of these large scale long-term processes will enable better nearshore short-term processes to be predicted.

b. Chemical Oceanography: Chemical oceanography of the Southern California Bight has been described in the FEIS for Sale No. 48 and in the Sale No. 48 Reference Paper No. II. Changes in the heavy metals and hydrocarbon burdens in the water will be discussed in the following section on water quality.

3. Water Quality:

The major sources of marine pollution at present in the Southern California Bight are municipal and industrial effluent discharges, surface runoff, and atmospheric deposition. The total volume of municipal wastewater discharged into the marine environment in the Bight exceeds 1×10^9 gallons each day (Table III.A.3-1). The effluent receives a variety of treatments and five of the municipal dischargers account for over 90 percent of the total volume output. Wastewater discharged from municipal outfalls contains a great diversity of potentially toxic or polluting chemicals some of which are listed in Table III.A.3-2 for the larger outfalls in Southern California. Surface runoff, the second source of pollutants into the ocean, is variable depending primarily on the amount of precipitation but averaged 66.9×10^9 gallons per year for the period 1971-1972. Aerial fallout is similarly difficult to quantify accurately, but rainfall washout may account for several thousand tons of pollutants input into the Bight each year (SCCRWP 1973).

a. Trace Metals: The Southern California Coastal Water Research Project (SCCRWP) has been monitoring pollutants for the past several years and some trends in concentration levels have been noted. Compared with

TABLE III.A.3-1

MASS EMISSION RATES OF GENERAL CONSTITUENTS, TRACE METALS, AND CHLORINATED HYDROCARBONS IN FINAL EFFLUENT OF MUNICIPAL WASTEWATER DISCHARGERS, 1979 (ND MEANS "NO DATA")

		Hyperion				
	JWPCP	5-mile	7-mile	Orange County	Point Loma	Oxnard
Flow						
gallons/year x 10^9	134	129	1.6	69	47	5.9
liters/year x 10^9	507	488	6.12	260	177	22.5
General constitutents						
(metric tons/year)						
Suspended solids	93,900	36,580	43,000[a]	36,400	25,000	2,140
BOD	103,000	70,230	ND	43,000	25,000	5,160
Oil and grease	20,200	9,270	2,450	6,760	6,490	330
NH_3-N	20,300	8,140	1,420	6,650	4,420	420
Organic-N	6,900	4,000	ND	ND	ND	52.0
Total-P	5,040	3,170	1,630	ND	ND	ND
MBAS	3,550	2,000	ND	ND	740	ND
Cyanide (CN)	87.2	43.9	1.10	13	0.6	0.3
Phenols	1,330	29.3	3.2	16.6	32.4	2.7
Trace metals						
(metric tons/year)						
Silver	9.48	21.4	4.28	2.86	4.03	0.45
Arsenic	5.07	6.34	1.35	0.78	1.67	0.11

a. Total solids
b. Based on thirty-two weekly composites and four 24-hr composites.
c. Based on two 1-week composites

Source: SCCRWP Annual Report 1970-1980

TABLE III.A.3-1 (Continued)

	JWPCP	Hyperion 5-mile	Hyperion 7-mile	Orange County	Point Loma	Oxnard
Cadmium	13.5	9.75	4.90	12.2	1.59	0.32
Chromium	130	34.1	32.6	29.6	9.51	1.24
Copper	112	92.7	53.2	75.7	23.2	2.23
Mercury	0.49	1.22	0.38	0.13	0.28	0.03
Nickel	107	78.0	20.8	36.4	12.6	1.0
Lead	73.5	73.2	29.9	28.6	16.3	2.1
Selenium	6.44	0.98	0.32	ND	ND	ND
Zinc	352	151	92	87	39	2.7
Chlorinated hydrocarbons (kg/year)						
Discharger values						
Total DDT	633[b]	88	6	ND	35	Not reported
Total PCB	350	300	57	425	35	23
Total identifiable chlorinated hydrocarbons	1,100	420	66	430	70	23
Project values[c]						
Total DDT	633	5.9	22.4	50	17.3	0.2
Total PCB	640	58	71	673	22.3	2.3

a. Total solids.
b. Based on thirty-two weekly composites and four 24-hr composites.
c. Based on two 1-week composites.

Source: SCCRWP Annual Report 1979-1980

TABLE.III A.3-2

AVERAGE CONCENTRATIONS OF GENERAL CONSTITUENTS, TRACE METALS, AND CHLORINATED HYDROCARBONS IN THE FINAL EFFLUENT OF MUNICIPAL WASTE DISCHARGERS, 1979 (ND MEANS "NO DATA")

		Hyperion				
	JWPCP	5-mile	7-mile	Orange County	Point Loma	Oxnard
Flow						
mgd	367	353	4.8	188	128	16.3
liters/day x 10^6	1,390	1,336	18.1	712	484	62
General constituents						
(mg/liter)						
Suspended solids	195	75	7,060[a]	140	143	95
Settleable solids						
(ml/liter	0.8	0.9	ND	ND	2.2	0.4
BOD	204	144	ND	166	142	229
Oil and grease	39.9	19	400	26.0	36.7	14.5
NH_3-N	40.1	16.7	232	25.6	25.0	18.8
Organic-N	13.7	8.2	ND	ND	ND	2.3
Total-P	9.9	6.5	266	ND	ND	ND
MBAS	7.0	4.1	ND	ND	4.2	ND
Cyanide (CN)	0.17	0.09	0.18	0.05	0.004	0.013
Phenols	2.6	0.06	0.53	0.06	0.18	0.12
Turbidity (JTU)	113	53	ND	93	66	68
Toxicity (TU)	4.17	0.55	ND	1.20	ND	1.5

a. Total solids.
b. Thirty-two weekly composites and four 24-hr composites
c. Two 1-week composites.

Source: SCCRWP Annual Report 1979-1980

TABLE.III A.3-2 (Continued)

	JWPCP	Hyperion 5-mile	Hyperion 7-mile	Orange County	Point Loma	Oxnard
Trace metals (Mg/liter)						
Silver	0.019	0.044	0.70	0.011	0.023	0.020
Arsenic	0.010	0.013	0.22	0.003	0.009	0.005
Cadmium	0.027	0.02	0.08	0.047	0.009	0.014
Chromium	0.257	0.07	5.33	0.114	0.054	0.055
Copper	0.220	0.19	8.7	0.291	0.131	0.099
Mercury	0.0010	0.0025	0.062	0.0005	0.0016	0.0015
Nickel	0.21	0.16	3.4	0.14	0.07	0.043
Lead	0.145	0.15	4.89	0.11	0.092	0.093
Selenium	0.013	0.002	0.05	ND	ND	ND
Zinc	0.69	0.31	15.0	0.34	0.22	0.12
Chlorinated hydrocarbons (mg/liter)						
Discharger values						
Total DDT	1.4^b	0.18	0.89	Not detected	0.2	Not reported
Total PCB	0.69	0.61	9.32	1.64	0.2	1
Total identifiable chlorinated hydrocarbons	2.17	0.86	10.8	1.65	0.4	1
Project values[c]						
Total DDT	1.4^b	0.01	3.38	0.19	0.10	0.01
Total PCB	1.26	0.12	10.8	2.60	0.11	0.10

a. Total Solids.
b. Thirty-two weekly composites and four 24-hr composites.
c. Two 1-week composites.

Source: SCCRWP Annual Report 1979-1980.

the mass emissions of 1977, the figures for 1979 for the five major dischargers (Table III.A.3-1) show a decrease in total amount discharged of 7% for cadmium, 35% for chromium, 12% for copper, 20% for nickel, 14% for zinc, and 40% for cyanides. Three trace metals showed increases in the mass emissions during that time between 1977 and 1979. Lead increased 10%, arsenic 10%, and silver 25% (SCCRWP, Annual Report 1979-80 draft).

The California Mussel Watch Program monitors water quality along the mainland coast and at stations on the offshore islands. Fourteen of the thirty-two stations monitored by the program are in Southern California and the mussels, Mytilus californianus, collected from these stations reflected the general trend throughout the State with mussels located near major urban centers showing greater concentrations of trace metals in tissues than mussels collected away from the urban areas (California State Mussel Watch, Vol. II, 1979). Areas with significant accumulations of lead, silver, and zinc in mussels are San Diego-La Jolla Ecological Reserve Area of Special Biological Significance (ASBS), Newport Beach Marine Life Refuge ASBS, Santa Catalina Island West ASBS, Royal Palms State Beach, Anacapa Island ASBS, and Mugu Lagoon to Latigo Point ASBS. Cadmium, lead, and zinc levels in mussels exceeded the proposed Food and Drug Administration (FDA) interim Alert level at: Santa Catalina Island ASBS, West Santa Barbara Island ASBS, San Miguel Island ASBS for cadmium; San Diego-La Jolla Ecological Reserve, Newport Beach Marine Life Refuge, Santa Catalina Island ASBS West, and Royal Palms State Beach for lead; San Diego-La Jolla Ecological Reserve ASBS, Newport Beach Marine Life Refuge ASBS, Santa Catalina Island ASBS West, and Royal Palms State Beach for zinc. Elevated levels of mercury were found in mussels at the west end of San Miguel Island ASBS and Point Conception; however, the levels were below the proposed FDA limit of 1.0 mg/g wet weight of tissue.

b. Hydrocarbons: The levels of various hydrocarbons in the waters of the Southern California Borderland remain a subject of concern and monitoring by local and State agencies. SCCRWP, in addition to the trace metals, monitors the mass emissions and concentrations of oil and grease and chlorinated hydrocarbons in local coastal waters. Oil and grease showed a 10% decrease in total amount discharged from 1977 to 1979 while the chlorinated hydrocarbons, DDT and PCB, continued a decline in mass emissions and sediments noted prior to 1977 with a decrease of 35% for DDT and 15% for PCB from 1977 to 1979.

In addition to trace metals, the California Mussel Watch Program measures the levels of selected hydrocarbons in mussel tissues. The program has shown that the level of oil pollution in California's bays and harbors is relatively high. Concentrations of petroleum accumulated by mussels in these areas are only slightly below those in mussels from the highly "polluted" area in the vicinity of a natural oil seep at Goleta Point near Santa Barbara. Along the shore of the Southern California Bight from Point Conception to La Jolla, levels of oil pollution in coastal waters, as indicated by their concentrations in mussels, are significantly elevated over those on the Central coast and over those in the vicinity of the Southern California Islands. Almost all California Mussel Watch samples produced evidence that a low level of chronic oil pollution may exist along the entire coast.

Table III.A.3.b-1 indicates the levels of the unresolved complex hydrocarbon mixtures (UCMs) found in mussels sampled. Low levels of UCMs were found in mussels sampled from the Southern California Islands. The presence of UCMs does not in itself provide proof for petroleum pollution since many components of this unresolved mixture may be biological compounds or from industrial sources other than petroleum-related sources. The triterpenes have been used to characterize many of the crude oils and the pentacyclic triterpenes in particular have been found in many crude oils but not in biologically derived hydrocarbons mixtures. The pentacyclic triterpene C_{28} hopane is especially interesting in that it appears to be present in California crude oils from the Monterey formation and absent in crude oils from elsewhere in the world with the exception of one crude from Russia. This C_{28} hopane has been detected in a number of mussel samples analyzed thus far indicating some of the tissue burden is derived from local sources (Figure III.A.3.b-1). Changes in the levels of these petroleum hydrocarbons are difficult to measure and interpret due to a change in the methods for extracting hydrocarbons and the sensitivity of instrumentation which resulted in higher levels of hydrocarbons being reported for the second year of the Mussel Watch Program.

Elevated levels of hydrocarbons in mussels are similar to the pattern found for the trace metals in which the highest concentrations are generally found in or near harbors and urban centers. The one exception in Southern California is the area around Coal Oil Point and several other sites near Santa Barbara and Point Conception where naturally occurring oil seeps are found and where mussels show elevated hydrocarbon burdens. The polycyclic aromatic compounds are of particular concern in regards to water quality as reflected in mussel tissue burdens since many of the aromatics are known or potential carcinogens. Bays and estuaries appear to be the most important source of these compounds since mussels from open coastal waters did not show evidence of accumulation. Levels of benzo(a)pyrene (an unsubstituted pentacyclic aromatic hydrocarbon with carcinogenic properties derived from combustion processes) reported by Dunn and Young (1976) were generally less than 0.1 ng/g wet weight of mussels from San Diego to La Jolla and from several Channel Islands. Higher values were found in animals collected from Royal Palms (0.5 ng/g), Seal Beach pilings (8.2 ng/g), Seal Beach rocks (2.3 ng/g), Newport Pier (0.4 ng/g), and Oceanside (2.3 ng/g).

i. Water Column: The levels of hydrocarbons in Southern California Bight waters is discussed briefly in the FEIS for OCS Sale No. 48 Volume I page 121. Values of dissolved hydrocarbons ranged from 0.03 ppb to 20 ppb.

ii. Sediments: The hydrocarbon levels in benthic sediments in the Southern California Bight are discussed briefly in the FEIS for OCS Sale No. 48 Volume I page 121. Recent surveys by SCCRWP (Wood and Mearns 1979) are in agreement with the range of figures found by the BLM surveys for hydrocarbon in sediments (FEIS Sale No. 48). SCCRWP noted a mean of 243 ±44 mg/kg of hexane extractable material in the top 2 cm of sediments at the 60 m depth contour. As in the BLM study, values ranged up to several thousand mg/kg.

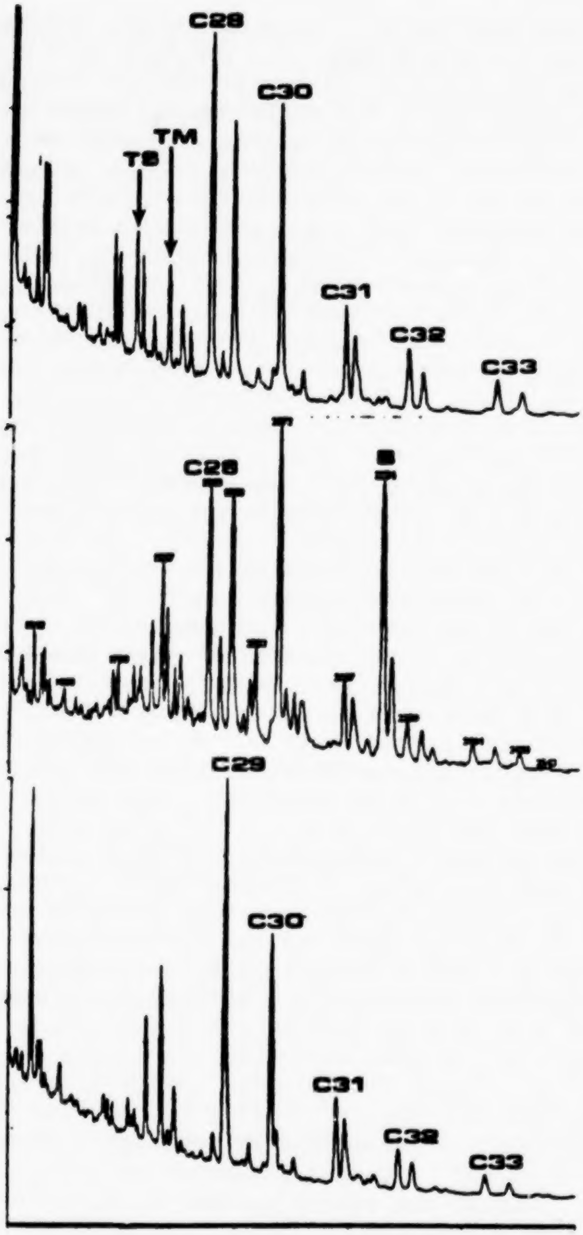

Figure III.A.3.b-1 Ion chromatogram, m/z 191, of extract of surf zone seawater from Goleta Point (top), an extract of mussels from Santa Cruz Island in the Southern California Bight (middle), and of an extract of oysters from the vicinity of Kuwait in the Arabian Gulf (bottom). The C-28 pentacyclic triterpane is clearly absent from the Kuwaiti sample

Source: California State Mussel Watch, Vol. III.
March 1980, Report No. 79-22.

TABLE III.A.3.b-1

DISTRIBUTION OF COMPLEX HYDROCARBON MIXTURES, PRINCIPALLY PETROLEUM, IN MUSSELS, MYTILUS SP., ON THE CALIFORNIA COAST IN 1978-79. CONCENTRATIONS IN MICROGRAMS/G DRY WEIGHT (PARTS PER MILLION); ARITHMETIC MEANS AND STANDARD DEVIATIONS

Area	No. of samples	Saturate fraction	Aromatic fraction	Total
Southern California Islands	14	10 ± 3	3 ± 0.8	12 ± 4
San Diego Harbor	1	170	49	220
Los Angeles Harbor	1	230	40	270
Goleta Point[1]	4	115 ± 91	290 ± 150	410 ± 230
Southern California Shore[2]	12	53 ± 59	11 ± 10	64 ± 68
Morro Bay	1	18	10	28
Central California Coast[3]	16	7 ± 3	3 ± 1	9 ± 4
Pacific Grove	2	14 ± 14	1.7 ± 1.9	15 ± 15
Elkhorn Slough	1	42	7	49
San Francisco Bay	1	130	53	180
Tomales Bay	1	5	5	10
Humboldt Bay	3	81 ± 5	15 ± 4	96 ± 6
Northern California Coast[4]	16	7 ± 3	3 ± 2	9 ± 4

[1] Bureau of Land Management Station, data from Risebrough, et al in press, 1979.

[2] La Jolla to Point Conception, excepting Goleta Point.

[3] Pt. Arguello to Farallon Islands, excepting Pacific Grove.

[4] Pt. Reyes to Redwoods-North.

Source: California State Mussels Watch Vol. III
March 1980 Report No. 79-22

c. Thermal Effluent: Ocean water used to cool both conventional fossil fuel power plants and nuclear power plants is discharged into the marine environment in Southern California. The volumes are given for each power generating station in the Southern California coastal area in Table III.A.3.c-1. The amount of cooling water varies with power requirements, some stations not operating unless demand exceeds a certain limit. Scheduled and unscheduled maintenance also cause variations in the amounts of thermal effluents discharged and the figures given in the table represent maximum design or permit volumes at present. Not included in the table are the volumes associated with the two new nuclear units at San Onofre which are scheduled to go into operation in the near future. These two new units will add approximately 3.84×10^9 gallons of heated water to the ocean each day.

4. Meteorology: Minor variations in the basic Mediterranean-type climate occur along the Southern California Bight. The rainstorms that strike the Ventura and Santa Barbara County areas are typically more intense than those further south. Thus, rainfall ranges from about 10 inches per year at San Diego to 20 inches near Point Conception. Air temperatures are quite moderate along the immediate coast and offshore areas. Temperatures never dip below freezing and rarely exceed 100°F. Average air temperatures range from the mid 50s in January to the upper 60s (°F) in August at nearly all of the coastal stations.

Prevailing wind flow during much of the year is generally from the west at west-facing beaches, and from the southwest at south-facing beaches. Beyond the outer islands, prevailing wind flows are from the northwest. These northwest winds are prevalent year round. Average wind speeds generally increase with increasing distance from shore, ranging from about 6 knots along the shoreline to 15 knots or more at the exposed island stations.

An inversion is defined as a layer in which the air temperature increases with height. Inversions are significant because pollutants are trapped beneath these layers. Inversions are present along the California Coast in summer nearly every day. Summer inversion heights are typically about 500 m (1,640 feet) in Southern California coastal sections. These inversion conditions, combined with prevailing onshore flow, create a potential air pollution problem for coastal areas located downwind of major emission sources.

Visibility is frequently obscured in the coastal areas due to fog, haze, and smoke. The incidence of low visibilities is maximized in summer and fall. Average visibility increases with distance from shore. During the summer, the percent occurrence of visibility less than 5 miles ranges from 24 percent at Long Beach to 10 percent at San Diego to about 7 percent over the outer coastal waters. In the winter, the frequency of low visibility is 9 percent, 12 percent, and 4 percent at Long Beach, San Diego, and outer coastal water areas, respectively.

TABLE III.A.3.c-1

THERMAL EFFLUENTS DISCHARGE INTO SOUTHERN CALIFORNIA COASTAL WATERS*

Fossil Fuel Plants	Volume (gal/day) x 10^6
Los Angeles Department of Water and Power	1,271
Harbor	382.6
Haynes	1,014
Scattergood	495.8
Southern California Edison Co.	
Alamitos	
El Segundo	596
Huntington Beach	516
Long Beach	741
Mandalay	255
Redondo	1,137
Ormond Beach	687
San Diego Gas and Electric	
Encino	1,149.8
Silver Gate	215.4
South Bay	600.5
Station B	173.3
Nuclear Fuel Plants	**Volume (gal/day) x 10^6**
San Onofre	447
Total All Plants	9,681.4

Source: Personal Communications from L.A. DWP, So. California Edison, San Diego Gas and Electric.

*These figures represent design maximum flows. Actual flows may be less than 50% of some figures due to power generating requirement variability.

5. Air Quality: Air quality in a particular area depends upon the prevailing weather conditions, local topography, and the amount of pollutants being emitted into the air. Pollutant levels are measured by sampling or monitoring potential contaminants at selected locations. The State and Federal governments have established levels of contaminants which should not be exceeded in order to protect public health and welfare (see Table 1, Appendix A). In California, the pollutants that frequently exceed these air quality standards are ozone (O_3), particulates (TSP), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and carbon monoxide (CO). Ozone, the most serious pollutant problem in California, is formed by the reaction of nitrogen oxides and hydrocarbons in the free atmosphere. The remaining pollutants are normally emitted directly into the atmosphere as a result of the combustion of fossil fuels.

Under the Clean Air Act Amendments of 1977, regions that exceed the air quality standards must develop an air pollution control plan so that the standards will be met by 1982 (1987 for some pollutants). The California Air Resources Board designates areas that exceeded the Federal air quality standard based upon monitored data. Table III.A.5-1 shows these designations for Southern California counties. It can be seen that the heavily populated San Diego and the South Coast Air Basin counties experience violations of many of the regulated pollutants. Of the coastal counties with sufficient monitoring data, only San Luis Obispo County meets the Federal oxidant standard. In general, NO_2 and CO violations occur only in densely urbanized areas. As might be expected, the higher pollution levels in urban locations can be directly attributed to the increased amount of pollutant emissions in these areas.

Oxidant levels are highest during the summer season because of the more intense inversion, prevailing onshore wind flows, and warm sunlight to speed the reaction of nitrogen oxides and hydrocarbons into ozone. Locations downwind (inland) of major urban emission sources are most severely affected by ozone. Thus, even though cities such as Riverside and Pomona have relatively low emissions, they experience severe oxidant problems because of pollutants emitted in the nearby coastal sections. The reason for this phenomenon is that the oxidant formation process takes several hours to occur, and by the time the reaction takes place, pollutants have been transported downwind. Other gaseous pollutants such as CO and SO_2 are generally restricted to the region surrounding major emission sources.

Air quality in the coastal zone is regulated by local air pollution control agencies, the California Air Resources Board (CARB) and the Federal Environmental Protection Agency (EPA). In general, local agencies are responsible for regulating stationary sources, while CARB regulates mobile sources as well as provides technical advice to the local jurisdictions. The EPA works closely with State and local agencies to ensure that Federal air pollution standards and regulations are met. In California, State and local regulations are usually more stringent than those promulgated by the EPA. Outer Continental Shelf (OCS) emissions are regulated by the Department of the Interior, USGS. OCS air quality regulations are discussed in Chapter I. Since OCS activities must be consistent with local coastal zone management plans, pertinent State and local regulations are also discussed in Chapter I.

TABLE III.A.5-1

EXISTING AIR QUALITY

Region	Pollutant O_3	 TSP	 NO_2	 SO_2	 CO
South Central Coast Air Basin					
San Luis Obispo County	B*	U	B	U	B
North Santa Barbara County	E	B	U	U	B
South Santa Barbara County	E	B	B	U	E
Ventura County	N	U	B	B	B
Channel Islands	U	U	U	U	U
South Coast Air Basin					
Los Angeles County	E	E	E	B	E
Orange County	E	E	E	B	E
San Bernardino County	E	E	E	B	E
Riverside County	E	E	E	B	E
San Diego Air Basin					
San Diego County	E	E	E	B	E

E - exceeds Federal air quality standards
B - better than Federal standards
U - unclassifiable - insufficient data

*Exceeds State of California O_3 standard.

Noise. Most of the region, immediately onshore from the proposed lease blocks, are moderately populated with some industry, particularly in Los Angeles and Orange Counties. At many shoreline locations, the predominant sounds are associated with wind noise, ocean surf, and infrequent vehicular traffic. Depending upon wind and sea conditions, ambient noise levels at these rural shorelines typically range between 40 and 60 decibels (dBA) and may approach 30 dBA during calm periods. Even though these sound levels are nearly the same as those experienced in suburban areas, many persons find "natural sounds" more esthetically pleasing than man-made sounds of the same level. Urban and industrialized shoreline areas, by comparison, may experience noise levels approaching 70 dBA.

B. Biological Environment

1. Plankton

a. Phytoplankton: Phytoplankton were discussed in detail in the Sale No. 48 Final Environmental Statement and in the Pacific OCS Reference Paper No. II (for Sale No. 48). Approximately 280 species of phytoplankton are reported from California waters (Riznyk, 1977) their distribution and abundance being controlled by amount of light (related to water turbidity), levels of nutrients (nitrates), currents, intensity of zooplankton grazing, temperature, and upwelling events. There are both seasonal and long-term components to phytoplankton variability.

b. Zooplankton: Zooplankton were discussed in detail in the Sale No. 48 Final Environmental Statement and in the Pacific OCS Reference Paper No. II (for Sale No. 48). Recent analyses of Cal COFI zooplankton data (Bernal and McGowan 1980) suggest that the classical view of population and production dynamics of epipelagic ecosystems being forced primarily by upwelling phenomena is not able to explain long-term changes in the systems. Advection of water masses correlates well with zooplankton biomass and large scale water mass anomalies are better predictors of zooplankton biomass than upwelling. Futhermore, the productive area off California is at least 500 km wide. Chelton (1980) also concludes the above based on an analysis of long-term meteorological and physical oceanographic data. He found tide level records a simple and convenient method of monitoring the interannual variability of the large-scale changes in the California Current.

2. Benthos

a. Intertidal

Rocky Shore Intertidal Communities. According to the older literature (California Department of Fish and Game, 1973 and others) the mainland coast of Southern California consists of approximately 80 percent sandy beaches and 20 percent rocky beaches. Conversely, the offshore islands had 80 percent rocky shores and 20 percent sandy beaches, except for San Nicolas Island. This island had mostly sandy beaches in approximately the same percentage as that of the mainland coast.

Littler (1979) and Littler and Littler (1980) suggest that often beach type is not an adequate criteria for intertidal substrate type and, particularly when boulder substrates are separated from rocky substrates, the relative percentages of substrate type also change. Table III.B.2.a-1 shows that there is relatively more rocky intertidal (lower intertidal) on the mainland coast and less rocky intertidal (except for San Nicolas Island) on the islands than predicted by beach type.

More detailed information of the intertidal can be found in Murray (1974), Ricketts, Calvin and Hedgpeth (1968), Carefoot (1979), Straughan and Kanter (1977, 1978, 1979), Littler (1977, 1978, 1979 a, b), Littler and Littler (1980), Straughan (1977, 1978, 1979), and U.S. Department of the Interior (1975, 1978a, 1978b, 1979 and 1980).

Since there are so many summaries of the intertidal area of Southern California, this discussion will primarily update the last EIS (U.S. Department of the Interior, 1979) of Southern California and will be limited to the BLM Studies Program.

Although rocky intertidal areas are very rich in plant and animal life, the inhabitants must pay a price and withstand an environmental pressure not endured by subtidal organisms. Because of tides, the intertidal community is exposed to the air for various amounts of time. This exposure causes organisms to dry out and eventually die, unless certain morphological, physiological or behavioral adaptations are made. Behavioral adaptations include hiding under rocks, large algae and invertebrates, or by becoming part of a subassemblage association such as a mussel bed.

The rockweed Pelvelia sp. and Hesperophycus sp. are upper middle intertidal inhabitants which provide cover and protection for numerous snails, limpets, crabs, etc; during low tide. Their importance with respect to oil spills will be discussed in the impact section. A mussel bed not only serves as a physical protection from predators and dessication, but collects sediments between its individuals and forms an additional substrate for organisms dependent upon sediment habitats. Kanter (1979) conceived a mussel bed as a three dimensional community and found 610 species at 20 locations (Figure III.B.2.a-1) within the Southern California Bight. Even this large number is a low documentation because organisms small enough to slip through a 0.5 mm mesh screen were not included in the estimate.

TABLE III.B.2.a-1

ABSOLUTE (KM) AND RELATIVE (%) AMOUNTS OF SUBSTRATE TYPES OBSERVED IN THE ROCKY INTERTIDAL ZONE OF THE CHANNEL ISLANDS AND MAINLAND COAST BETWEEN POINT ARGUELLO AND THE MEXICAN BORDER. Source: Littler (1979) and Littler and Littler (1980)

Location	Per Cent Substrate Type			Kilometers of Substrate Type		
	Rock	Boulder Beach	Sand	Rock	Boulder Beach	Sand
San Miguel Island	63.7	0.2	36.1	33.1	0.1	18.8
Santa Rosa Island	61.8	5.0	33.3	52.7	4.2	28.4
Santa Cruz Island	66.2	14.8	19.2	83.6	18.8	24.4
Anacapa Island	70.0	14.8	15.2	15.2	3.2	3.3
Santa Barbara Island	73.6	22.2	4.2	8.2	2.5	0.5
Santa Catalina Island	35.3	49.5	15.3	35.8	50.2	15.5
San Nicolas Island	60.7	4.6	34.7	25.5	1.9	14.5
San Clemente Island	68.6	17.3	14.0	62.5	15.8	12.8
Mean %	62.5	16.0	21.5			
Total km				316.6	96.7	118.2
Mainland between Point Arguello and Mexican Border	Upper Intertidal				Upper Intertidal	
	16.5	8.4	75.1	80.9	41.3	369.4
	Lower Intertidal				Lower Intertidal	
	29.1	6.7	64.2	142.7	32.6	314.3

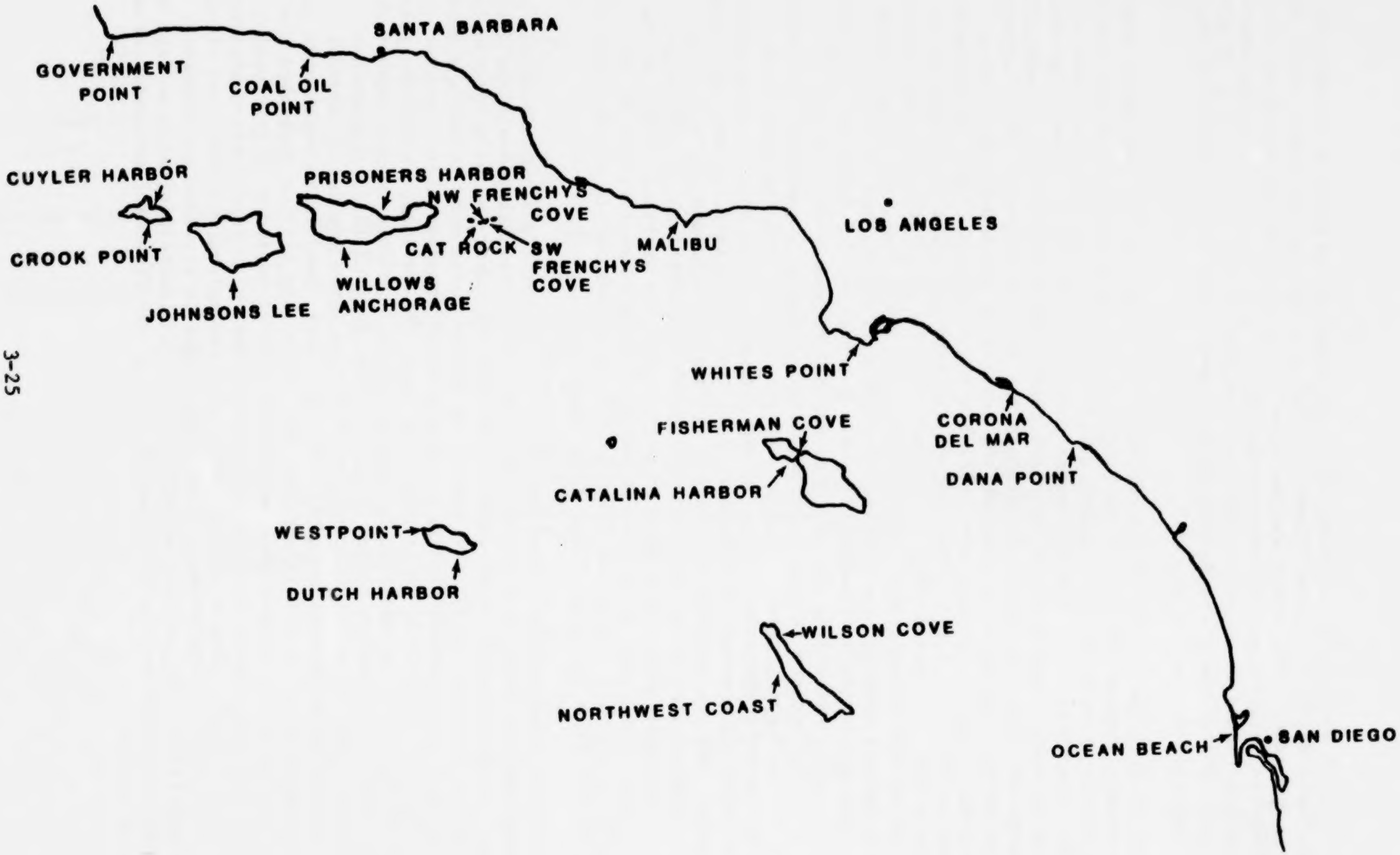
SANTA BARBARA
GOVERNMENT POINT
COAL OIL POINT
CUYLER HARBOR
CROOK POINT
JOHNSONS LEE
PRISONERS HARBOR
WILLOWS ANCHORAGE
NW FRENCHYS COVE
CAT ROCK
SW FRENCHYS COVE
MALIBU
LOS ANGELES
WHITES POINT
FISHERMAN COVE
CATALINA HARBOR
CORONA DEL MAR
DANA POINT
WESTPOINT
DUTCH HARBOR
WILSON COVE
NORTHWEST COAST
OCEAN BEACH
SAN DIEGO

Figure III.B.2.a-1 Rocky Intertidal Study Sites Source: Littler (1978)

Littler and associates (Littler, 1979) reported 539 species at 22 Southern California Bight locations (Figure III.B.2.a-2) during the 3-year (1975 to 1978) BLM study. All these species were macroorganisms and consisted of 224 macrophyte (plants) and 315 macroinvertebrate species. Most species appeared to be restricted to certain geographic portions of the Bight. Only 42 species (25 macrophyte, and 17 macroinvertebrate) were found at all locations (Table III.B.2.a-2).

Computer programs (based on cluster analysis) were used to show which sampling sites were similar and assess the biogeographic relationships within the Bight. The result of both Kanter's mussel study (using species abundance) and Littler's rocky intertidal study (using percent cover and frequency) showed a general north to south trend with the mainland coast somewhat different in assemblage composition than the islands. Although the details differed, there appeared to be enough similarity to combine the results of these analyses into a grouping of locations which best reflects their results. This arrangement is shown in Table III.B.a-3. The largest differences in the groupings as it affects Table III.B.a-3 are: 1) Kanter put both sides of Santa Cruz Island in the coldest water group. However, Littler found the inner side (facing Santa Barbara Channel) was similar to cold water sites, but the outer side was more similar to intermediate to warm water sites; 2) There was a general inconsistency concerning the north to south arrangement of mainland sites; and 3) Santa Barbara Island, not considered in Kanter's analysis, is located with the warm water group. However, it was classed with the more intermediate water temperature groups in one parameter (frequency of occurrence). It probably is somewhat more transitional than Santa Catalina and San Clemente Islands. The two physical variables, besides currents and the resulting water temperature, which tended to obscure biogeographical relationships during these analyses, were sand inundation and the vertical extent of the intertidal area. The study site located at the northwest corner of San Nicolas Island had a peculiar but unpredictable grouping in all analyses and was omitted from Table III.B.2.a-3.

Characteristic of middle intertidal zones in Southern California are the closely compact algal turf communities which also show island-mainland differences. Extensive algal turf communities were prevalent in the middle-to-low intertidal zones at nearly all sites, the island turfs were larger and more robust with epiphytes consisting of medium-sized frondose algae; however, mainland turf communities near populated areas (as in the previous two years) were characterized by smaller and simpler forms with more compact structure, which were often heavily coated with a predominance of fine, filamentous epiphytes. The two mainland sites removed from human population centers (Government Point and Ocean Beach) had algal turf communities which more nearly approximated those of the island systems. From this Littler suggested that the highly epiphytized compact turf morphology, characterized by algal populations having relatively large surface-to-volume ratios, high reproductive capacities, high growth rates, simple thallus forms, and mechanisms for short and simple life histories, is characteristic of communities in stressed environments. Such populations may in fact be highly useful in identifying intermediate seral communities maintained in subclimax by lack of environmental constancy or some form of stress.

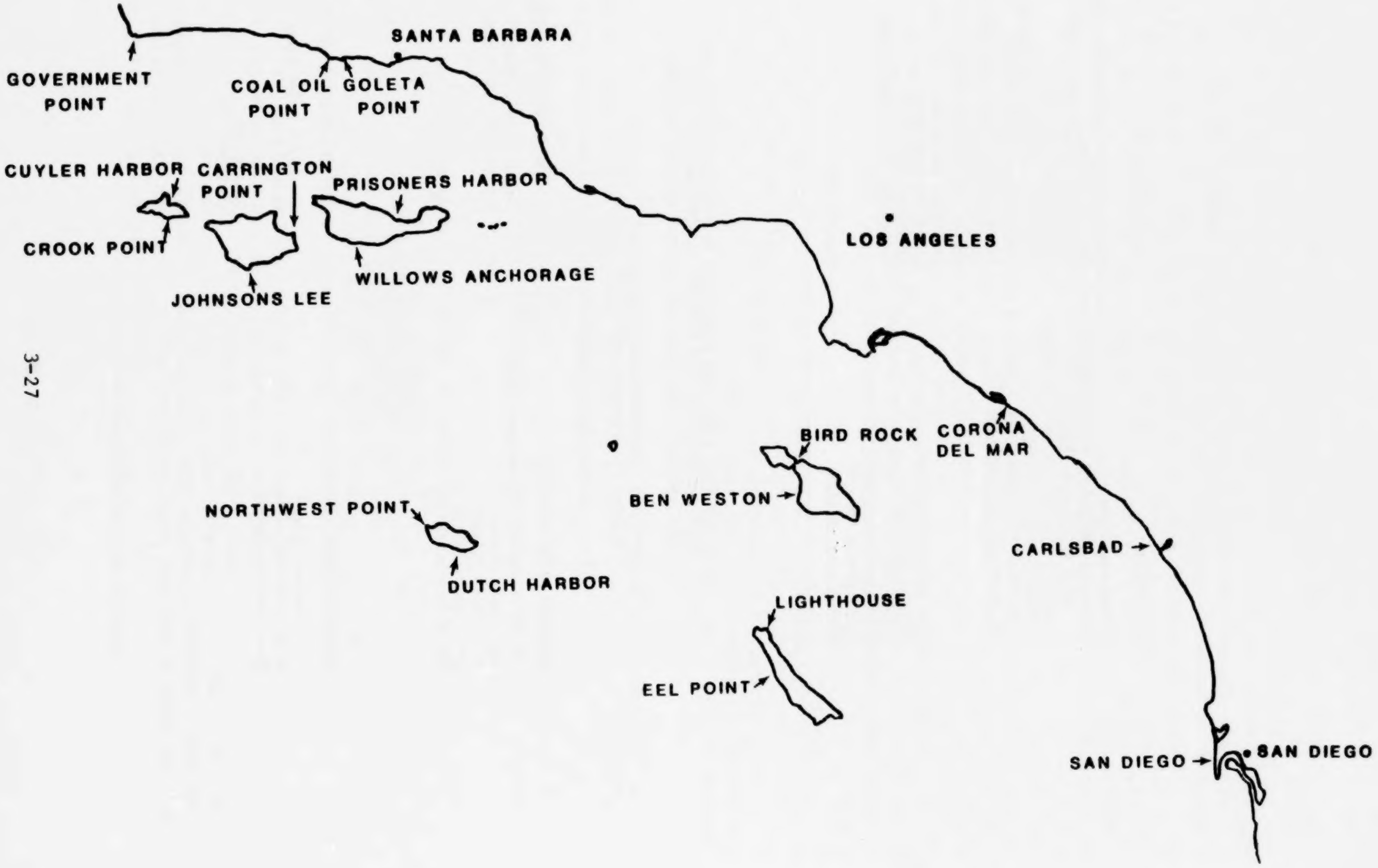
SANTA BARBARA
GOVERNMENT POINT
COAL OIL POINT
GOLETA POINT
CUYLER HARBOR
CARRINGTON POINT
PRISONERS HARBOR
CROOK POINT
JOHNSONS LEE
WILLOWS ANCHORAGE
LOS ANGELES
BIRD ROCK
CORONA DEL MAR
BEN WESTON
NORTHWEST POINT
DUTCH HARBOR
CARLSBAD
LIGHTHOUSE
EEL POINT
SAN DIEGO
SAN DIEGO

Figure III.B.2.a-2 Mussel Bed Study Sites

Source: Kanter (1978)

TABLE III.B.2.a-2

TAXA COMMON TO ALL 22 STUDY SITES THROUGHOUT 1975-78

Source: Littler (1979)

Macrophytes:

Blue-green algae
Bossiella *orbigniana* ssp. *dichotoma*
Ceramium *eatonianum/sinicola* (2)
Corallina *officinalis* var. *chilensis*
Corallina *vancouveriensis*
Crustose Corallinaceae (2)
Gelidium *coulteri/pusillum* (2)

Ulva *californica/lobata* (2)
Egregia *menziesii*
Cryptopleura spp. (4)
Gigartina *canaliculata*
Polysiphonia spp. (6)
Rhodoglossum *affine*

Macroinvertebrates:

Phragmatopoma *californica*
Balanus *glandula*
Chthamalus *fissus/dalli* (2)
Pachygrapsus *crassipes*
Tetraclita *squamosa* *rubescens*
Anthopleura *elegantissima*
Acmaea *(Collisella)* *limatula*
Acmaea *(Collisella)* *pelta*
Acmaea *(Collisella)* *scabra*
Littorina *planaxis*
Littorina *scutulata*
Cyanoplax *hartwegii*
Nuttallina *fluxa/californica* (2)

Pagurus spp. (2)

TABLE III.B.2.a-3

SITE GROUPINGS BASED UPON SIMILARITY OF ROCKY INTERTIDAL AND MUSSEL ASSEMBLAGES FROM COMBINED CLUSTER ANALYSIS FROM LITTLER (FREQUENCY AND COVER) AND KANTER (SPECIES ABUNDANCE)

0 = outer or seaward side of an island
I = inner or shoreward side of an island

Source: Littler (1978) Kanter (1978)

Northern Group (islands)

*Point Conception (Government Point)
San Miguel Island I, 0
Santa Rosa Island I, 0
San Nicolas Island 0
Santa Cruz Island I

Northern Mainland Group

Santa Barbara Channel
eg: (Coal Oil Point)
(Goleta Point)
(Ventura)
Malibu

Intermediate Islands Group

Anacapa Island I, 0
Santa Cruz Island 0

Southern Islands Group

San Clemente Island I, 0
Santa Catalina Island I, 0
Santa Barbara Island

Southern Mainland Group

Oceanside - San Diego
Whites Point
Corona Del Mar
Dana Point
Carlsbad

*Actually, this is a mainland site.

Because Littler considers space and light as the limiting resource in the rocky intertidal, biotic cover was the primary ecological concern of the study. Major cover throughout the Bight at Littler's stations was contributed by plants, primarily by blue-green algae, corralline algae, the red algae *Gigartina conaliculata* and surf grass. Brown algae, particularly the feather boa kelp *Egregia* and southern kelp palm *Eisenia*, were also considered important because of their large size and high cover at their relatively restricted vertical location in the lower intertidal. In terms of overall cover, macroinvertebrates contributed less than the plants, although several animal species were important to the cover. Sandcastle worms *Phragmatopoma*, barnacles and mussels *Mytilus* contributed amounts equivalent to many of the more important macrophytes.

Seasonal variability was relatively small, especially when compared with many other areas of the United States. Kanter found seasonal variability so small, he discontinued seasonal sampling after the first year of the study. Littler found some decrease in most biological parameters following the winter months. This was primarily contributed by algae which tended to be reduced during low tides coinciding with warm Santa Ana winds. This suggests that local or even site-specific conditions tend to predominate more often and obscure the broad climatic effects.

The most important mussel bed features associated with community differences were quantitative and qualitative differences in the potential microhabitats. Those features associated with greater species numbers are primarily associated with sediment characteristics. Those features associated with lower species numbers included the quantity of tar, and rock and shell debris trapped within the mussel bed.

Sandy Beach Intertidal. The environment of the exposed sandy intertidal is considerably less stable than that of the rocky intertidal. Every wave on a sandy intertidal beach moves a great deal of sand.

Organisms on surf-swept sandy beaches achieve protection from wave shock by burying themselves in the sand (burrowing). That sandy beaches have limited populations, is not unexpected.

Because of the continued restructuring of sandy beaches, the number of individuals per species varies greatly from year to year. There is, however, a characteristic group of animals which lives just below the low tide line or within the sand between the tidal lines. A few even live higher up the beach in burrows or beneath organic debris. Some of these organisms are active only at night or on cloudy days; others remain hidden in the sand.

Straughan (1977, 1978, 1979) reported that physical factors defining the energy regime of sandy beaches are probably directly responsible for the variation in biotic diversity observed. It is likely also that these factors play an important role in determining the actual species composition. The sand crab, *Emerita* dominated the fauna of the steepest, most unstable beaches. The worm associations are best developed on the flattest, most regular beaches such as Scripps, Point Loma, and Coal Oil Point.

Figure III.B.2.a-3 depicts the profile of a typical, gently sloping, beach assemblage with the four zones of Allen (1976) superimposed. Data from the upper, middle, and lower box stations showed that the upper beach is normally dominated by the amphipod beach hoppers of the general Orchestoidea and Orchestia. These animals remain in the moist sand above high tide during day and emerge to feed at night. The sand crab Emerita analoga dominates the lower high tide and mid tide zones. Its habit of following the tides as it feeds on dinoflagellates, other minute organisms and small plant particles produces a broad tidal zonation. The major inhabitants of the mid and low tide zones are polychaetous (segmented) and nemertean (round) worms, especially on beaches with a gently sloping foreshore. The polychaete Euzonus mucronata typically occupies a narrow zone in the vicinity of mid tide where it occurs. Another sand crab, Blepharipoda, is infrequently found at the lowest tides along with the bean clam Donax gouldii. This description is a general one with many exceptions due to the great range of physiographic beach types in the Southern California Bight.

Overall, the differences between the biota of various sites were greater than seasonal differences between surveys. Another general observation is that island beach surveys were not separated from mainland beach surveys, suggesting similarity of biota.

Rather, what emerges is a pattern in which conditions at some sites favor development of relatively rich species groups regardless of their geographic position. Scripps Beach is well developed in all three infaunal categories while Point Dume is depauperate. Species of worms (polychaetes, nemerteans) appear to diminish most regularly down the column of sites. These species occur most commonly in the flat, gentle slopes of the middle and lower intertidal. The absence of worms at Point Mugu and Point Dume suggest that these sites lack a physically differentiated lower zone. Three depauperate sites, Point Mugu, Torrance and Point Dume, have faunas comprised entirely or primarily of the sand crab Emerita analoga which is characteristic of surf-swept exposed beaches. The island sites, San Miguel, Santa Cruz, San Nicolas and San Clemente, form an anomalous group in which crustaceans are relatively well represented.

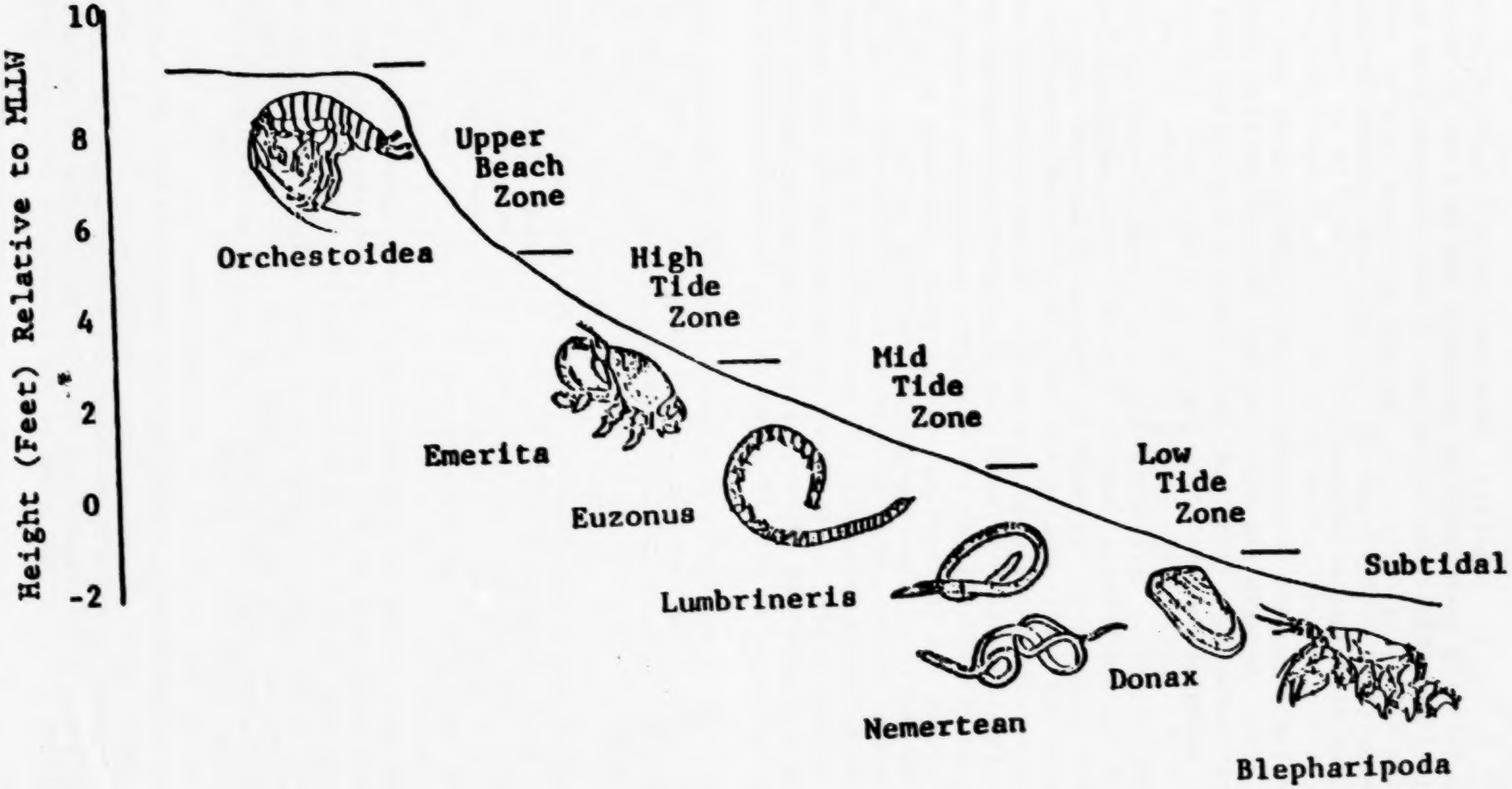
Height (Feet) Relative to MLLW
10
8
6
4
2
0
-2
Upper Beach Zone
High Tide Zone
Mid Tide Zone
Low Tide Zone
Subtidal
Orchestoidea
Emerita
Euzonus
Lumbrineris
Nemertean
Donax
Blepharipoda

Figure III.B.2.a-3 Schematic Profile of a Typical Exposed Sandy Beach

Source: Allen (1976), Ricketts and Calvin (1968), and Smith and Carlton (eds.) (1975)

b. Subtidal: This section will provide an overview of the benthos. For a more detailed treatment see Sale No. 35 EIS and Sale No. 48 EIS (including Reference Papers No. II and III) published by the Department of Interior (1975, 1978a, b, c). The BLM sponsored benthic studies, by Fauchauld and Jones (1977, 1978), and the foraminiferan studies by Douglas (1977, 1978) also present valuable information.

Emery (1960) divided the Southern California offshore area into the mainland shelf (from the mainland coast to the 100 m or 300 foot contour) and the continental borderland (from the 100 m contour line to the Patton Enscarpment 50 to 150 miles offshore).

The benthos of the California Bight is extremely complex, consisting of many species and assemblages, and is difficult to summarize. There are many reasons for this complexity. 1) Numerous available habitats are created by the topography of the continental borderland, islands, deep basins, submarine canyons, and the resulting sediment complexity. 2) The relatively stable temperature and salinity conditions favor a biologically accommodated system consisting of many species (Sanders, 1968). 3) The bight area is a biogeographic transition zone between the Californian and Oregonian Provinces with the division line at Point Conception (Valentine 1966). Because the water temperatures and other factors are often typical of both provinces, the Bight has species of the northern Oregonian Province and the California Province, as well as species which are only found in Southern California Bight. Valentine (1966), for example, reported 180 species of Bivalvia and Gastropoda having a north-south geographic range of only 60 miles within the bight area.

Fauchald and Jones (1977) indicated the single most important environmental variable governing the distribution of species was depth. It appeared to be significantly more important than sediment and areal location, at least on the shelves and slopes.

Benthos - Shallow Water Soft Bottom. Shallow subtidal sandy bottoms are relatively harsh environments for benthic organisms, because wave action causes unstable, shifting bottoms which have few hiding places, or attachment substrates for sessile organisms. These conditions prevent an extremely diverse assemblage in comparison with a kelp bed or a shallow rocky area.

Species of this habitat typically include types that have adapted to the shifting sands such as species that occupy transient or relatively permanent deep burrows, (e.g., the long-neck clams), or that can burrow quickly, (e.g., the sand crabs Blepharipoda), or that construct flexible tubes, as Loimia medusa, or that are spindle-shaped (e.g., the lancelet Branchiostoma, the polychaetes Ophelia and Nephtys, and peanut worms Sipunculus), (Allan Hancock Foundation 1965).

As part of the "State Survey" during the late 1950s the Allen Hancock Foundation (1965) reported that although in depths of 3 to 9 m (10 to 30 feet) there were far fewer species than deeper areas; the number of individuals were not greatly reduced in comparison with deeper bottoms on the mainland shelf. This was particularly true with polychaetous worms, but crustaceans, molluscs, and the spiny skinned echinoderms were reduced in number of specimens.

One of the more important species at certain areas was the sand dollar *Dendraster excentricus* which appears to be fairly widespread on the shallow waters of the California Bight mainland. One of the more comprehensive studies conducted in the Bight is the study by Morin (1981, in press) at Zuma Beach. Morin divided the area into three zones based upon the principal species present. Zone 1, beginning at about 3 m (10 feet) and extending to a depth of 6 m (20 feet) was characterized by the pismo clam *Tivella stultorum*, the sea pansy *Renilla kollikeri* and its predator the pansy nudibranch *Armina californica*. Near the shoreward edge of this zone, were relatively large populations of the purple olive snail *Olivella biplicata*. Zone 2 occurring roughly between 6 m - 9.1 m (20 feet and 30 feet) was the sand dollar dominated zone where densities of over 400 individuals/m^2 were reached. Sand dollars so completely dominated this zone that, except for starfish and crab predators, a parasitic snail and several species of barnacles and hydroids primarily attached to the sand dollars tests, they were the only major species occupying the bottom.

Merrill and Hobson (1970) reported densities as high as 1,044 individuals/m^2 at Zuma Beach. They also reported the bed to be extensive, extending horizontally along the coast for (5.8 km) (3 miles) and from 15.2 m (50 feet) to 91.4 m (300 feet) wide. The third zone occurs at slightly quieter deeper depths where sand is disturbed less by surge. Here species having a more equal numerical dominance were found.

Mainland Coast. Under similar conditions of depth, sediment type, distance from the mainland coast, etc., certain species tend to be found in relatively high number of individuals. The entire mainland shelf of the Bight exhibits similar dominant species with regional differences manifested by high abundances of one or two species normally occurring in moderate numbers. The most numerous and frequently occurring species on the mainland shelf are shown in Table III.B.2.b-1. In terms of frequency, the polychaete *Lumbrineris* sp. was most frequently collected, but the brittle star *Amphiodia urtica* was more numerically abundant than any other species. The 60 percent frequency of occurrence of the brittle star in the BLM study was somewhat less than the 85 percent frequency in the State study (Allan Hancock Foundation 1965), although a wide distribution of this species occurred during both studies. The principal species of the mainland shelf are similar to that of the island shelves shown in Table III.B. 2.b-2. Perhaps the main difference is the lesser importance of the brittle star *Amphiodia urtica* on the island shelves, although it was numerous at some stations. Comparison of the most commonly occurring species reported in the state study (Jones 1969) and the BLM study indicates fairly good agreement in the two studies separated by a period of about 15 years on the mainland shelf. The only very common species of the BLM study not also abundant in the State study was the biavalve *Parvilucina tenuisculpta*.

An exception to the consistency generalization may be the echiuroid worm *Listriolobus*. Near Santa Barbara (Allan Hancock Foundation 1965) reported the vast majority of specimens both in numbers and biomass (80 percent) consisted

TABLE III.B.2.b-1

MOST FREQUENTLY OCCURRING SPECIES ON MAINLAND SHELF

	Mean No./ Area	Frequency	
		Ratio	Percentage
Lumbrineris sp. polychaete	3.8	79/98	80.6
Parvilucina tenuisculpta bivalve	7.0	69/98	70.4
Axinopsida serricata snail	5.6	67/98	68.4
Amphiodia urtica brittle star	10.0	59/98	60.2
Pectinaria californiensis polychaete	2.1	51/98	53.1
Heterophoxus oculatus amphipod	2.4	52/98	52.0
Euphilomedes carcharodonta Ostracod	5.7	49/98	42.9
Tellina carpenteri bivalve	1.3	42/98	42.9

Source: Fauchald and Jones (1977) and SAI (1976).

TABLE III.B.2.b-2

MOST FREQUENTLY OCCURRING SPECIES ON ISLAND SHELVES

	Frequency	
	Ratio	Percentage
Lumbrineris sp. polychaete	61/92	66.3
Aoroides columbiae amphipod	59/92	64.1
Parvilucina tenuisculpta bivalve	54/92	58.7
Euphilomedes carcharodonta ostracod	49/92	52.5
Tellina carpenteri bivalve	42/92	45.6

Source: Fauchald and Jones (1977) and SAI (1976).

of the echiuroid worm Listriolobus pelodes. This species remained dominant in 1969, (Fauchald 1971) but was greatly reduced as compared to the early 1960s at the time of the Allan Hancock Foundation Study.

The Los Angeles County Sanitation District (1976) reported a huge increase in the population off Palos Verdes near the Whites Point sewage outfall. The worms first became abundant at an intermediate distance of several miles from the outfall, then after a couple of years populations increased near the outfall. The reason for the buildup of large populations in an area is not fully understood. Allan Hancock Foundation (1965) attributed the large populations to extremely fine sediment, but the recent findings by the L.A. Sanitation District indicated that fine sediment and high organic matter may be instrumental in some population buildups, provided the level of toxicants of the sediments are below a certain level.

There has been speculation that the population of Listriolobus may be maintained at relatively high numbers near Santa Barbara by a constant current gyre which allows a consistent settlement of organically rich sediment on the bottom. Recent surveys have failed to substantiate this, however.

Island Shelves. Most of the island shelves sampled during the BLM study had a rather large number of species having over a 50 percent frequency and many even over a 75 percent frequency which indicates these species do characterize the areas or at least are widely distributed within them. An abbreviated list of the principal species from all these areas is shown in Table III.B.2.b-2. Many of the species on this list are also extremely important on the mainland shelf particularly the polychaete Lumbrineris sp. and the bivalve Parvilucina tenuisculpta (Table III.B.2.b-1). The only important species, in terms of frequency, on the island shelves which is not important on the mainland shelves, is the amphipod Aoroides columbiae.

One noticeable difference between the northern island shelves and the mainland shelves is the greater relative number of microcrustaceans on island shelves. This was particularly evident at the 8 stations to the north of the Channel Islands where the relative dominance of crustaceans was over 67 percent compared to approximately 20 to 30 percent on the mainland shelves. Data on the number of species and specimens indicate there may be no significant difference between the island and mainland shelves.

Submarine Canyons. The canyons extending from the coastline to the deep basins contain unique and varied fauna (Hartman 1963). Canyon habitats are subject to considerable fluctuations in environmental conditions because they serve as natural channels for shoreward movements of upwelling waters and organisms and for downward transport of runoff, sand, and debris. These processes result in widely varying conditions, to which the indigenous organisms must adjust.

Hartman (1963) surveyed the 13 large canyons off Southern California. The principal species of the canyons differed from those of the mainland shelf only meters away, and species composition reflected bottom sediment size and depth. No communities based on dominant species were defined. Some of Hartman's conclusions on the faunas of the canyons include:

> Each canyon is found to support a richly diversified fauna, high in specific entities, with as many as 262 species in a longshore (Newport) canyon.
>
> The largest numbers of species in a canyon occur in shallowest, or shelf depths, and they are members of the shelf or slope fauna. There is a gradual decline in numbers of species (though not necessarily specimens) with depth, but there are deviations from this principle, perhaps partly due to factors other than depth.
>
> The replacement of species from one canyon to the next is such that from 30 percent to 60 percent are different. These differences may be partly correlated with latitude, with change in sediments, with distance from shore, or with other, still unknown factors, concerned with the biology of specific entities.

Slopes. Fauchald and Jones (1977) reported the most frequently encountered benthic species on mainland slopes was the ice cream cone worm *Pectinaria californiensis*. Other species having wide distributions, based on frequency of occurrence, are the shelless aplacophoran *Limifossor fratula*, the polychaete *Prionospio cirrifera*, and based upon abundance, the bamboo worm *Maldane sarsi*.

The mean wet weight standing crop differences between the mainland shelf and slope were not evident, although an "atypical" sample or samples could have weighted the deeper areas somewhat high (Fauchald and Jones 1977). As with the mainland, the number of species on the Santa Cruz Basin slope decreased (by a factor of 3) as did the number of specimens (by a factor of 4) from the shallow water fauna.

Tanner-Cortes Banks and Ridge. Fauchald and Jones (1977) divided the soft bottom of Tanner-Cortes Banks into a bank top assemblage and a bank-trough assemblage. *Amphiodia urtica* and *Parvilucina tenuisculpta* are also relatively important here. Recent analysis by Jones (personal communication) indicates that these assemblages are significantly different from the other assemblages of the bight. The highly productive and unusual hard bottoms of the banks are of even greater interest, however, and are discussed below with hard bottoms.

Both the Santa Rosa Ridge and the Banks have proven to have a very rich soft bottom fauna with a well developed carnivore component of the food chain which was reduced on the mainland shelf and other areas of similar depths (Fauchald and Jones 1979). Food chain interrelationships of the benthic community are not well understood, but the large carnivour link probably reflects either high organic enrichment of the bottoms of the ridge-bank or "normalcy" with the mainland shelf community altered in some way causing a reduction of carnivores within the bottom sediments.

The most important discovery of the BLM study from a scientific standpoint was the nonoplacophoran *Vema hyalina* (McLean 1979), a representative of a group of mollusks thought extinct until 1952 and possibly a very primitive form of the very important mollusca phylum. The truly amazing aspect of this discovery, however, lies in the fact that this is the only monoplacophoran ever taken at depths shallow enough to allow the specimens to be transported alive to the laboratory for examination and study (Lowenstam 1978). Although Lowenstam (personal communication) has sampled several other areas for other specimens, so far it has only been collected at one general area on Santa Rosa-Cortes Ridge on cobbles at depths of 174 to 402 m (571 to 1,319 feet). Although it was reported at 174 m (571 feet) from cobbles collected by fishermen, this has not been confirmed.

Other species or associations on the ridge, banks, or slope which may be rare and important to protect include (John Mohr, personal communication):

> *Dimya sp.*, a bivalve taken only on Tanner Bank and taken only once,
>
> *Crania californica*, a rare lampshell (Brachiopoda) of the Banks,
>
> "a living Pleistocene submarine marl assemblage of foraminiferans,"
>
> *Pogonophorans*, the largest non-parasitic gutless animals,
>
> *Vestimentiferans*, a large gutless worm typical of deep ridges,
>
> "Purple coral" *Allopora californica*, a coral found in abuandance on the banks, and at only a few other locations in the Bight.

Basins. The deep basins have a uniformly low standing crop biomass (ranging from 1.5 grams per square meter to about 50 g/m^2 and averaging from 3 to 12 g/m^2), relatively few species and low population densities (11 to 120 specimens per square meter) especially when compared with the mainland shelf. Hartman and Barnard (1960) reported 317 species in the basins compared with over 1700 on the mainland shelf. Emery (1960) indicated the three shallowest basins, Santa Barbara, Santa Monica, and San Pedro, have a far more impoverished fauna than the outer basins because of greatly reduced oxygen content in the water and sediments. The low oxygen content is due to: 1) correspondence of the sill depth at 500 to 700 m (1,650 to 2,310 feet) with the oceanic oxygen minimum layer, and 2) little decomposition of organic matter before reaching the basin floors.

Hartman and Barnard (1960), however, determined that the shallow basins have approximately the same standing crop as the outer basins, two or three times deeper. It would be expected that food supplies to the deeper and seaward basins would be smaller than to shallow basins, suggesting that food might be a limiting factor to the standing crop in the deeper basins, while dissolved oxygen is limiting in the shallower basins. Theoretically, shallow basins are provided with larger organic food supplies, which are reworked at a slower rate (discounting bacteria) and, thus, accumulate and are lost by burial, especially since sedimentation should be faster in the shallow nearshore basins.

Comparisons between the data of Fauchald and Jones (1977) and those of Hartman and Barnard (1960) point out several differences. Several of the dominant species were the same in the two studies, especially in San Pedro Basin. However, there were many differences, which indicated a general lack of species having large enough populations to be sampled frequently enough to be considered major dominant species.

Benthic Foraminifera. As part of the BLM study of the Southern California Bight, Douglas et al. (1977) sampled microbenthic foraminifera. Both number of species and standing crop (number of live specimens/cm^2) were higher in warm water temperature months (summer) than during cold water months (winter). This was particularly so at mid-water areas where as much as a 10-fold warm water increase was recorded. The greatest number of species were collected in a few isolated basins while the lowest number of species were found at the outer banks and ridge areas as well as areas having low dissolved oxygen. The highest standing crop values were recorded in the deepest parts of the inner basins while the inner mainland shelf outer basins generally had low values.

Depth was an extremely important variable, particularly for the standing crop whose contours roughly paralleled bathymetric contours of the area.

Five communities of foraminifera can be defined as presently living in the sampled area of the Southern California Bight. The communities have been defined as geographically limited, recurrent associations of species. While membership in a particular community need not be exclusive, most species achieve their maximum abundance and occurrence in only one association. Four of the communities are predominately found in the shallow water (less than 15 m (49 feet)) of the mainland and insular shelf, and the offshore banks and ridges. They are the Nonionella-Eggerella Community, the dominant association of the mainland shelf; the Cassidulina-Hanzawaia Community, the dominant association of the insular shelf and shallow banks; the Buccella-Cibicides Community, present on offshore banks and ridges; and the Bolivina-Trochammina Community, a cosmopolitan association of species found throughout the Borderland.

A single community, the Epistominella-Suggrunda Community, is found in deep water environments below the shelf edge. Its definition is based almost entirely upon samples from the two nearshore basins, the Santa Monica and San Pedro Basins. Evidence from other sources indicates that other foraminiferal associations are present in the middle and outer basins of the Borderland. A principal feature of the Epistominella-Suggrunda Community is its occurrence in low oxygen environments, where the oxygen content falls to below 0.3ml/l. (Minimum values in San Pedro Basin are near 0.09 ml/l.) Maximum abundances of the dominant species of the community are recorded in the deeper portions of the nearshore basins.

Basically, the shallow water communities of both the inner and outer Borderland are found in water of northern origins with high temperature, low salinity, and high oxygen content, and on substrates with a medium to coarse grain size, varying carbonate content, and a low organic carbon content. Foraminiferal communities of the slope and basin are found in water of southern origin, with low temperature, high salinity, and low oxygen content; and on substrate with a fine grain size, low carbonate content, and high organic carbon content.

Subtidal Hard Bottoms. Few systematic studies of any specific reef area have been conducted in the Southern California Bight. Perhaps the relationships reported by Peguegnat (1963, 1964, and 1968) of a reef 9.5 to 18 m (31.3 to 59.4 feet) deep, located off Corona del Mar is illustrative of shallow near-shore reefs in general. According to Peguegnat:

> The degree of water movement on the reef, which results primarily from the propagation of surface waves, varies inversely with depth. It was suggested that this pattern of water movement determines the distribution of the major units of the epifauna through its effects upon the availability of food of different types at particular points on the reef. Suspended organic matter is not only more abundant on the upper levels of the reef, but its rate of delivery to crust-forming organisms is enhanced by turbulence. Disposition of organic materials removed from the upper part of the reef is facilitated by the sharp reduction in degree of water movement along the lower sides and bottom of the reef.

The depth differential of the reef was great enough to involve vertical temperature difference of as much as 6°C. The part of Reef 500 above the thermocline exhibits faunal affinities to southern epifaunas, (e.g. in regard to densities of the rock oyster *Chama pelluoida* and associated species), whereas other species with northern affinities, such as *Henricia leviuscula*, occur only at the reef base and are absent from the shallower reef located nearby.

In general, the predominant species in the upper 2 zones are sessile suspension feeders, which form thick incrustations that form biotopes for large numbers of small sessile and motile species. In the lower zones, on the other hand, the predominant species tend to be motile scavengers and deposit feeders; and the incrustations that are present are thin and formed by single species. These zones, together with their general depth limits along the transect where the sampling was done, are: Reef-top Zone, 9.5-12.5 m, where the important epifaunal features is an incrustation formed by the rock oyster *Chama pellucida*; the Mid-reef Zone, 12.5-14.5 m, which supports a thick growth of calcareous ectoprocts; the Reef-base Zone, 14.5-16.5 m, where large sea urchins and deposit feeding sea cucumbers predominate; and the Mixed-bottom Zone, 16.5 m, which is located on the adjacent sea bottom of sediments and rock slabs and which supports a mixture of infaunal and epifaunal species. There was a general top-to-bottom decline in biomass, number of species and individuals.

Tanner Bank and Cortes Bank are located approximately 179 km (111 miles) and 186 km (116 miles) west and west-southwest of San Diego. These banks are the shallowest portions of the Santa Rosa Cortes Ridge which stretches from San Miguel Island on the north, and past San Clemente Island on the south. The areal extent of Tanner Bank and Cortes Bank, at 60 m (197 feet), is approximately 769 ha (1,900 acres) and 2,914 ha (7,200 acres), respectively. Both banks have high relief rocky bottoms. Tanner Bank's shallowest point is 25 m (82 feet), Cortes Bank's is 1 m (3 feet). These banks, therefore, act as the outermost islands of distribution for California shallow water benthic organisms.

Tanner and Cortes Banks are within the California Current. The main contribution of the California Current to the Banks is as a transport mechanism for the cool, low-salinity subarctic water, modified by influx from rivers and a gradual warming as it moves south.

Strong bottom surge and trench-ridge type topography of the Banks are thought to interact to enhance upwelling. Despite the assumed nutrient-rich water, water visibility usually ranged from 11 to 31 m (35 to more than 100 feet) during calm to moderate seas (Interstate Electronics 1979).

Several general conclusions were derived by the BLM-sponsored Interstate Electronics survey of Tanner and Cortes Banks which help with our understanding.

Many of the species observed during the present survey are similar to those observed along the Southern California coastline and the Channel Islands although relative abundances of many species differed considerably.

Of major biological significance is that the depth ranges and deepest depths of occurrence of some communities and species are greater on the Banks than has been previously noted for the Southern California Bight. The extreme water clarity results in the expansion of algal community depths from less than 50 m (165 feet) to over 100 m (330 feet). Corals showed range extensions into shallower waters as compared to both northern and southern populations probably as a result of the Banks' locations between open ocean current and the Southern California Gyre.

In general, most of the fish observed at Tanner and Cortes were within documented depth ranges, with only a few species deeper than previously recorded; however, the algae and invertebrates showed increased depth ranges and deeper depths of occurrence. This differential is probably due to the much more extensive data base for depth distribution of fish, due to commercial and sportfisheries for many species.

Also, of major significance, is the occurrence of species previously known only from more northern or southern waters. Such occurrences show that Tanner and Cortes Banks are an important area of overlap of northern and southern species distributions. The extension of depth ranges of many species and the high diversity of corals and other organisms in the study area demonstrates that the Banks act as an important refuge for many Southern California Bight organisms currently disappearing from more heavily impacted nearshore areas.

Additional generalizations of the area were obtained during a series of Pacific OCS Office conducted biological surveys (Smith 1976). The Banks serve as important feeding grounds for large numbers of California sea lions, Zalophus californianus and many species of sea birds. Other points which are peculiar to the individual banks are: Cortes Bank is the home of large numbers of spiny lobsters Panulirus interruptus and abalone Haliotis spp.; Tanner Bank has the highest recorded densities of chestnut cowries Cyprae spadicea and sheephead fish Pimelometopon pulchrum. These banks are the last remaining area in California with large numbers of giant seabass Stereolepis gigas. Between the soft bottom box core survey (Fauchald and Jones 1977, 1978) and the hard bottom transect survey (Wolfson 1978) also sponsored by BLM, many new species were discovered.

Because of the biological importance and uniqueness of the area, the Interstate Electronics Study is summarized as follows.

Forty-one dives were made in the submersible, with a scientific observer, in six study areas.

Five major communities including eleven subcommunity species associations were distinguished from the submersible survey data for Tanner and Cortes Banks (Table III.B.2.b-3).

Three of these, the sea palm/erect coralline algae (Eisenia/Calliarthron), the large-bladed brown algae (Agarum/Laminaria), and the encrusting coralline algae communities are characterized by the dominant macroalgae seen on rocky substrates. The fourth is a deep-water sea lily/brittle star (Florometra/ophiuroid) community on rocky substrate; the fifth is a sand community with sea urchins and starfish (Lytechinus/asteroids). The rocky substrate biota were fairly uniform in composition in all areas and showed a clear and relatively consistent depth distribution.

No differences were noted between the biota occurring on different types of rock substrate although some differences in exposure to local currents produced differences in the organisms found on low relief rocks as compared to high rocks or cliffs. The proximity to sand did produce significant differences in the biota.

The brown algae and sea palm/erect corraline algae communities supported a higher diversity and biomass of organisms than the deeper encrusting coralline community. Coelenterates (36 species), echinoderms (38 species) sponges (14 species) and molluscs (40 species) were the best represented invertebrate phyla on the banks.

Crustaceans (lobsters, crabs, and shrimp) were rarely observed due to their cryptic or nocturnal habits and small size. Shrimp were much more visible in the evening than during daylight hours. Essentially all crustacea observed were seen in medium to high relief areas where ledges, cracks, and crevices were numerous and extensive. A few crabs were seen on open sand. It is likely that crustacean biomass is considerably larger in the Banks area than was observed because they are preferred food items for many fish (Quast 1968);

TABLE III.B.2.b-3

COMMUNITIES OBSERVED AT TANNER AND CORTES BANKS
Source: Interstate Electronics (1979)

Community Dominants	Subcommunity Dominants	Depth Range
Sea palm/erect coralline alga (*Eisenia*/*Calliarthron*)	red algae (*Gelidium*)	14 to 26 m
	large-bladed brown algae (*Laminaria*/*Agarum*)	14 to 40 m
	brittle starfish (*Ophiothrix*)	14 to 40 m
	brown algae (*Zonaria*)	26 to 40 m
Large-bladed brown algae (*Agarum*/*Laminaria*)	erect coralline algae (*Calliarthron*)	40 to 60 m
	sea fan/starfish (*Eugorgia*/*Mediaster*)	40 to 60 m
	brown algae (*Zonaria*)	40 to 60 m
Encrusting *coralline* algae	starfish (*Mediaster*)	60 to 68 m
	seafan/starfish/sponge (*Plumarella*/*Mediaster*/sponge)	68 to 89 m
Sea lily/brittle star (*Florometra*/Ophiuroid)		89 to 149 m
Sand Community	sea urchin/starfish (*Lytechinus*/asteroids)	Various

and the fish population was considered to be large.

Forty species of molluscs were observed in the study area, however only six species could be considered common (*Calliostoma annulatum*, *Tegula regina*, *Astraea gibberosa*, *Acmaea funiculata*, *Nassarius insculptus*, and *Cidarina cidaris*). Several unusual snails were seen including *Fusitriton oregonensis* (which has only one previous record this far south of San Nicolas Is.), *Calliostoma turbinum*, a rare or new species of the Muriceidae or Cancellaridae, and a peculiar unidentified banded snail.

The most widespread species, which were seen essentially throughout the depth range and in all rocky areas of the survey included the purple column anemone (*Stomphia venosa*), the anemone (*Tealia piscivera*), an ostrich-plume hydroid, the white urchin (*Lytechinus anamesus*), a starfish (*Mediaster aequalis*), and encrusting and massive sponges (Demospongiae).

Sand patches and channels occurred throughout the study area and were characterized by the white urchin (*Lytechinus anamesus*) and several asteroids (including *Mediaster aequalis*, *Luidia foliolata*, and *Astropecten verrilli*). Although several species, notably fish and gastropods, were fairly common in several communities, most species distributions conformed fairly well to community boundaries.

Allopora californica was patchy throughout its distribution 18 to 123 m (59 to 403 feet) and occurred on all areas except on Santa Rosa Ridge which was apparently too deep. Colonies were found to be associated with exposed northwest slopes on boulder and ridge tops below 30 m (98 feet) and mostly on sides of rocks in shallower areas, apparently maximizing exposure to the currents while minimizing storm damage. However, in the shallowest, presumably maximum-energy regimes, *Allopora* was not found and this may be attributable to storm breakage of the brittle branches. This hydrocoral was also absent from areas which were subject to sand scour or silt deposition. It may be concluded that *Allopora californica* requires moderately high energy currents or surge essentially free from silt or sand. Most of these colonies were pink or red in color with only small stands of the more typical purple variety being found at 45 m (148 feet) depth north of Bishop rock and at 96 m (315 feet) on Northwest Cortes Bank. Only on Northwest Cortes was *Allopora* commonly seen below 70 m (230 feet) depth.

Kelp. The giant kelp or *Macrocystis*, identified by having many floats (pneumatocysts), extends from Sitka, Alaska to Point Abrevjas, Baja California, but does not form extensive forests north of Ana Nuevo. For more detailed information, see POCS Reference Paper No. II. (Department of the Interior (1978c).

Unless otherwise indicated, the information for *Macrocystis* was taken from North (1971) who conducted his studies in Southern California.

The distribution of the giant kelp in Southern California is shown in Visual No. 2 of Sale No. 48 EIS (Department of the Interior 1978a). These data are from the BLM sponsored study reported by Hodder (1977) conducted in 1975.

In general, the plant kingdom has a slightly different life cycle than does the animal kingdom, involving an alteration of two different life stages called the gametophyte and sporophyte stages. Particularly in larger species, these stages consist of different morphological forms, the sporophyte being the larger and longer lived in kelp. The life history of Macrocystis has been developed in the laboratory with confirmation of some of its phases in the field, although the gametophyte generation has apparently never been found in the field.

The life history of Macroscystis consists of a large, long-lived (from 1 to 6 years) sporophyte plant and a microscopic short-lived (several months) gametophyte plant. Except for some asexual reproduction of one species in a limited geographic range, this sexual life cycle is necessary for the propagation of the species. The completion of the life cycle in Southern California requires 1 year in optimal environmental conditions and probably somewhat longer under other conditions.

North (1971) determined that kelp closest to an outfall disappears first and further regression spreads from this center. This pattern was the principal evidence suggesting a relationship between waste discharge and kelp disappearance.

The most likely cause of widespread deterioration appeared to be turbidity, but direct evidence is lacking. As suggested by Frey (1971), once deterioration of kelp areas has begun in polluted areas, reestablishment of kelp by natural mechanisms is nearly impossible so long as the pollutants continue to be released into the area. Conditions associated with sewage outfalls have led to the establishment of large sea urchin populations. The urchins not only detroy the remaining kelp through grazing but keep young plants from becoming established. Once the kelp is gone, the urchins are able to survive by living off the sewage discharge nutrients. The urchins can apparently absorb 50 percent of their minimum daily nutrient requirements from the surrounding water. This ability allows large urchin populations to continue to exist in areas that formerly contained kelp beds. Kelp beds can and have been restored by human transplanting and management, however.

Many environmental factors influence the distribution of Macrocystis beds. On a geographic level, temperature is the most important, but in local areas substrate, surf, and depth are the most important. Although kelp is limited to rocky substrate at exposed areas of heavy surf, it becomes established on a sand or mud substrate in relatively quiet waters where danger of burial by sediment shifts is small. Holdfasts of adult kelp can withstand some smothering, but stipes are sensitive to being enclosed or covered by silt. Shifting sediments are more of a hazard to juveniles which have small holdfasts that are easily buried.

The inner limit of a kelp bed often appears to be controlled by wave action. In calm, protected areas Macrocystis beds occur as shallow as 2 or 3 m (6 to 9 feet) or even appear intertidally. Along open coasts, the inner limit usually is at depths of 5 to 10 m (15 to 30 feet).

The outer limit of kelp beds is probably determined by light intensity at the bottom. In turbid waters, beds are limited to depths of 15 to 20 m (45-65 feet while in clear waters they often occur at depths of 25 to 30 m (80-100 feet). The fact that the outer edge of kelp beds is typically even, whereas the inner edge is usually irregular, has caused the hypothesis that a single, fairly constant factor limits its outward distribution.

As discussed by North (1971), cyclical fluctuations in Macrocystis beds do not follow a single, well-defined pattern. He listed three kinds of regular changes, non-regular changes, and lack of changes. The latter occurs only from Santa Barbara to Point Conception on sandy bottoms.

According to North (1971), the niche filled by Macrocystis includes at least five roles:

(1) Primary producer of organic matter.
(2) Provides shelter and crevice environments.
(3) Provides substrate for encrusting organisms.
(4) Shades the bottom, giving rise to two separate effects:
    a. Modifies vegetation by affecting photosynthesis.
    b. Attracts animals that avoid bright light.
(5) Competes with water in radiant energy absorption by means of a flotation mechanism.

Dawson (1966) emphasized that kelp forests contain associated algae throughout, although, as North (1971) has indicated, they are greatly reduced compared to hard-bottom areas outside the beds.

Although kelp beds look very much alike at the surface, there are usually striking differences on the sea floor, and the composition of associated algal species varies with location in accord with environmental factors including substrate, exposure, upwelling, temperature, depth, etc., (Dawson, 1966). Particularly where the surface canopy is not extremely thick (McFarland and Prescott 1959) or in open patches within the bed, there occurs a multilayered vegetative cover (Dawson, 1966) which is very broadly similar to a multilayered tropical forest. Below the thin surface canopy Dawson described an intermediate layer consisting of species that are stalked or tree-like having heavy, erect stipes which hold the fronds off the bottom. The third or bottom laywer consists of short forms of brown, green, and red algae in varying degrees of profusion and array of forms. Dawson (1966) indicated jointed corallines are the most ubiquitous, growing both outside and in the deep shade of the canopy. Crustose calcareous corallines occur as pink layers on bottom rocks and often cement together pebbles, shells, and sand to form nodules and areas of rough pavement which can increase the suitable area for kelp attachment.

Another habitat is attachment on the kelp itself. Epiphytic algae receive stiff competition from encrusting annuals and are confined primarily to senile tissues of the kelp.

The "hard" substrate created by kelp plants greatly increases the habitat available to filter feeding animals (invertebrates). Phytoplankton are captured by sessile filter feeding invertebrates which encrust the solid surfaces in kelp beds. Unlike many other large brown algae, including *Nereocystis*, and *Pelagophycus*, which concentrate the laminal surfaces in one region of the water column, the *Macrocystis* assemblage is unique because it has large surface areas for attachment at all levels. The attacked sessile invertebrates, therefore, can utilize phytoplankton from the entire water column.

An extensive list reported by North (1971), of invertebrates associated with a kelp bed includes over 625 species. The 74 invertebrates considered by North to be common are summarized in Murray (1974), Department of the Interior (1975, 1978c). A total of over 810 kinds of organisms are associated with kelp beds in Southern California and northern Baja California, including 128 species of macrophytes (20 common). Quast (1968) listed 57 species of fishes. The majority of these species may not have an obligatory relationship with giant kelp, but they utilize every conceivable nook and crevice of the plant and adjacent area, thereby greatly increasing the total habitat available to them.

Because the lifespan of a kelp blade is only 2 to 4 months the sessile fauna colonizing these surfaces are also short-lived. These species are primarily forms that settle, develop and reproduce rapidly.

The heavy shade of the sea floor created by the kelp canopy causes a drastic reduction of the standing crop of shorter algae. This barren substrate becomes overgrown with sessile invertebrates, frequently clustered on top of each other to depths of 10 to 20 cm (3.9 to 7.8 inches). Because of the more enduring substrate, longer-lived species are found. The holdfast, with its labyrinth of substrates, provides a very important habitat on the sea floor.

Prominent filter feeders in kelp beds, in their usual order of importance, are bryozoans, especially *Membranipora*; hydroids; crustaceans; tunicates; and sponges. Also usually present, particularly on the bottom, are bivalves, gorgonian corals, and polychaete worms.

3. Fish and Fisheries

a. Fish: The marine environment off Southern California is rich in fish life. Of the 562 species of coastal marine fishes known to occur in California (Miller and Lea 1972; California Sea Grant Program and University of California 1976), 485 species (87%) are found in Southern California waters. These counts do not include all of the deep-sea fishes, so the total number of species in Southern California actually exceeds 485.

The coastal region off California constitutes a transition zone between southern warm-temperate, sub-tropical waters and northern cold-temperate waters. Both warm-water and cold-water fishes are found either seasonally or year-round off Southern California (Horn 1974). In addition to temperature, fish distribution depends on light, currents, food availability, and the presence or absence of predators (Southern California Coastal Water Research Project 1973).

The marine environment off Southern California can be divided into two main regions (Horn 1974): 1) the mainland and island shelf including offshore banks and ridges, and 2) the deep sea basins. While these designations are useful, the regions are not mutually exclusive. Overlap in species composition is apparent, particularly in transition areas such as the deep shelf and continental slope.

The mainland and island shelf region is generally located nearshore, in water depths of less than 200 m (656 feet). The northern anchovy (Engraulis mordax) is one of the most abundant species in the region and is important to the area because it occupies a central position in the trophic structure of coastal waters. Rockfish and flatfish are dominant in the demersal fauna. Special habitats for species in the shelf region include kelp beds, bays, estuaries, and man-made structures such as harbors and oil platforms.

Many deep-sea fishes undergo periodic vertical migrations and, therefore, may be found in the upper 100-500 m layer of the ocean. However, they are members of a rather distinctive group since they live at least part of their lives in waters several hundred to thousands of meters deep. These fishes are generally small (<300 mm long), black or dark with silvery reflective sides and frequently with luminescent organs. Members of the families Myctophidae (lanternfish), Bathylagidae, and Gonostomidae are the most abundant deep-sea fishes off Southern California, and they occupy central positions in oceanic food webs. These families, especially the Myctophidae, appear to occupy important positions in the trophic structure of offshore waters comparable to that of the anchovy in shallow, more inshore waters (Horn 1974).

Nektonic invertebrates are less well studied and less well known than are the fishes. Most important to the pelagic ecosystem are pelagic red crabs belonging to the decapod family, Galatheidae (BLM 1979). Other important species include pink shrimp (Pandalus jordani), bay shrimp (Crago spp.), spot prawn (Pandalus platyceros), ridgeback prawn (Eusicyonia ingentus) and market squid (Loligo opalescens).

More detailed descriptions of the fishes and nektonic invertebrates of Southern California are given by Horn (1974), and Bureau of Land Management (1978, 1979).

b. Commercial Fisheries: California is an important center for commercial fishing interests. In 1976, the most recent year for which economic data are available, one billion pounds of fish and shellfish worth $249 million were landed or shipped into California (Oliphant 1979). This value represents the money paid to the fishermen. The true value of the fishing industry is much greater due to the contributions of the support, processing, transportation, and marketing industries.

The total annual landings and shipments of fish into California varies considerably from year to year (Figure III.B.3.b-1), depending in part on fish availability, market demand, weather conditions, and harvest regulations. Most of these fish are landed into Southern California, primarily at Terminal Island (Table III.B.3.b-1). Species composition of the catch also varies from year to year (Figure III.B.3.b-2), but in recent years the primary species landed into Southern California have been yellowfin tuna, northern anchovy, skipjack tuna, and jack mackerel. The most valuable species are yellowfin tuna and skipjack tuna (Figure III.B.3.b-3).

Fish and invertebrates are caught throughout most of the Southern California Bight (Figure III.B.3.b-4). Purse seining for northern anchovy is prevalent from the Santa Barbara Channel to Santa Catalina Island. Purse seining for jack mackerel occurs primarily near Tanner and Cortes Banks, San Clemente Island and Santa Catalina Island. Trawling for bottom fish and shrimp occurs at present primarily in the Santa Barbara Channel at depths less than 400 meters, but this fishery is expanding to new areas and greater depths. The tuna catch is the result of a worldwide operation, with most of the fish being brought to Southern California from waters off Central America, South America, and West Africa.

In 1977, the Fishery Conservation and Management Act of 1976 (Public Law 94-265) was implemented giving the United States jurisdictional control and management responsibility for all fisheries except migratory tuna within a conterminous distance of 200 miles of the coast. The Pacific Fishery Management Council, in cooperation with the Department of Commerce, regulates the amount of harvest, harvest seasons and type of gear to be used by foreign and domestic fishermen in Federal waters off California, Oregon and Washington. In California State waters (0-3 miles from shore), the California Dept. of Fish and Game regulates fishing.

A number of Southern California seaweeds are of economic value. The giant kelp *Macrocystis pyrifera* occurs in dense stands (see Section III.B.2.b) and can be conveniently harvested by specially designed ships known as kelp cutters. In recent years, over 150,000 tons of kelp (primarily *M. pyrifera*) have been harvested (Figure III.B.3.b-5). Although a large number of useful products can be extracted from *M. pyrifera*, the greatest demand is for a polysaccharide called algin. Algin is used as a suspending, thickening, emulsifying, stabilizing, film-forming and water-holding agent in food, beverage, pharmaceutical, cosmetic, paint, rubber, and other industries. Several species of red algae have been utilized by man either directly as animal and human food or as a source for extracted materials such as agar and carrageenin. However, this resource is underutilized because collection must be by hand to avoid taking species of no economic value that grow next to the desired plants.

Mariculture in Southern California is in its infant stages compared to other parts of the State, other States, and other countries. Most efforts in Southern California are focused on research and development. Studies are being conducted with kelp, abalone, lobster, shrimp, northern anchovy, Pacific sardine, Pacific mackerel, and striped bass.

More detailed information on commercial fisheries in Southern California is given by Horn (1974), and Bureau of Land Management (1978, 1979).

c. Sport Fisheries: Sportfishing is a very important recreational activity throughout Southern California. Five fishing methods predominate: shore, pier, private boat, commercial passenger fishing vessel (partyboat), and diving. Currently, the National Marine Fisheries Service and the California Department of Fish and Game are conducting a survey of marine recreational fisheries with an emphasis on shore, pier and private boat fishing. The results of the first 6 months of this study (July to December 1979) should be available in April 1981.

Comprehensive historical data on sportfishing are available only for commercial passenger fishing vessels. In 1979, the most recent year for which data are available, 5.1 million fish were caught in Southern California. This is the largest catch ever recorded (Figure III.B.3.c-1). Although in previous years California barracuda, Pacific bonito, kelp bass, and sand bass dominated the catch, the most important components now are rockfish and Pacific mackerel (Figure III.B.3.c-2). The areas where the largest catches occur and greatest efforts are expended are near San Pedro, San Diego, and the Coronado Islands (Figures III.B.3.c-3 and III.B.3.c-4). Rockfish are caught near all of the islands and the mainland. Kelp bass are taken primarily near San Pedro, Santa Catalina Island, San Clemente Island, San Diego and the Coronado Islands. Pacific mackerel are taken primarily along the mainland between San Pedro and San Diego. The locations of specific fishing areas are mapped by Squire and Smith (1977).

Shellfish are either taken by skin and scuba divers or from the shore at low tide. The principal species taken are abalones (*Haliotis* spp.), rock scallops (*Hinnites multirugosus*), spiny lobsters (*Panulirus interruptus*), mussels (*Mytilus* spp.), crabs (*Cancer* spp.), and clams. Although diving data from private boats and shore are not available, dive boats report (California Dept. Fish and Game, unpublished data) that abalones are taken primarily near Anacapa Island, Santa Cruz Island, Santa Catalina Island and San Clemente Island. Rock scallops are frequently taken near Anacapa Island and Santa Cruz Island.

More detailed information on sportfishing in Southern California is given by Horn (1974). Squire and Smith (1977), and Bureau of Land Management (1978, 1979).

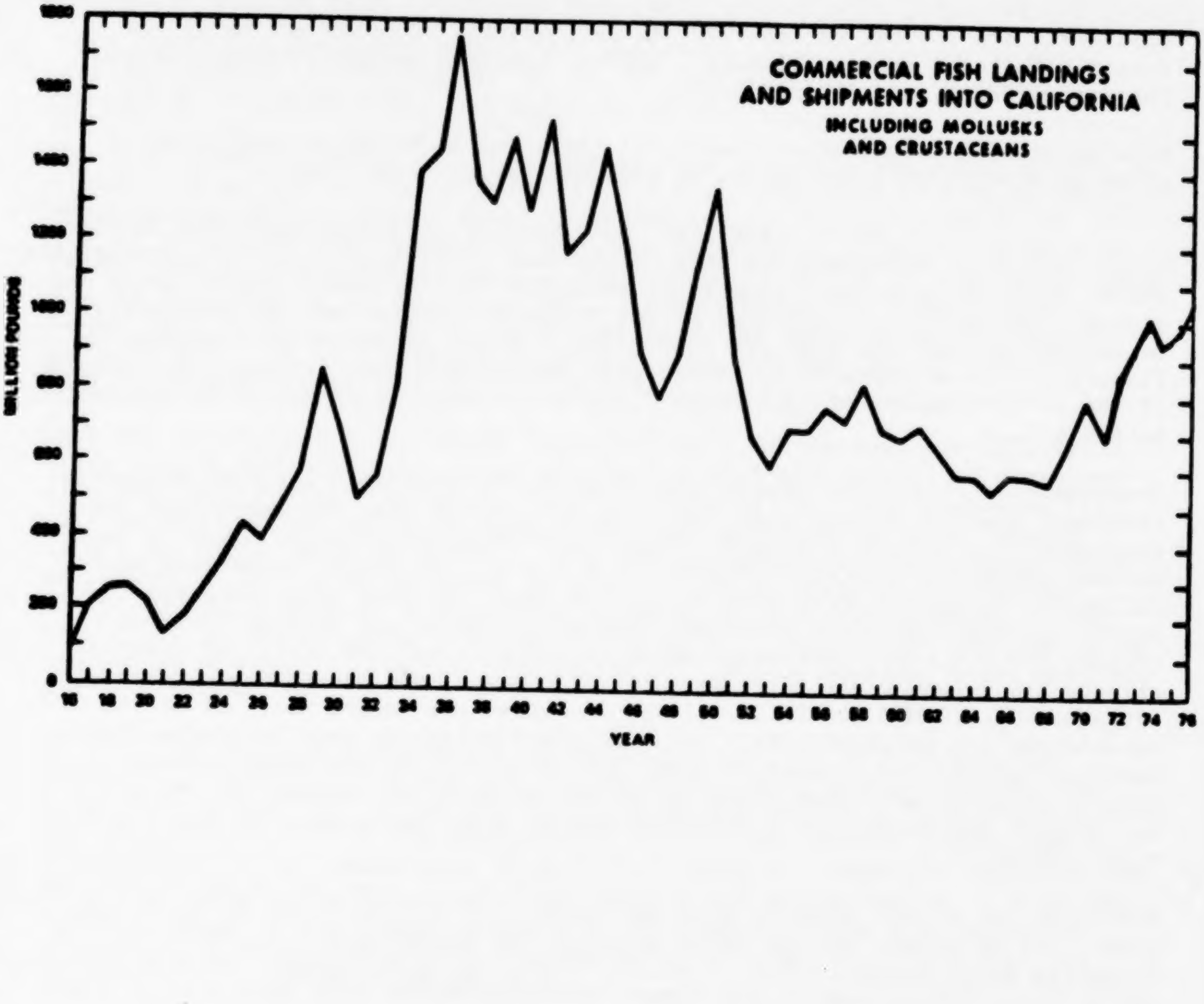

Figure III.B.3.b-1 Total annual landings and shipments into California of commercial fish, mollusks and crustaceans. Sardine deliveries to reduction ships from 1930-1938 are included. Since 1965, tunas are the only species included in shipments.[a]

[a] Source: The most recent California Marine Fish Landings published by the California Dept. of Fish and Game.

TABLE III.B.3.b-1

MAJOR CALIFORNIA COMMERCIAL FISHING PORTS BASED ON THE AVERAGE WEIGHT AND ON THE AVERAGE VALUE OF FISH LANDINGS FROM 1972-1976.[a]

Port	Weight (lbs.)	Percent (%) Of State Total	Port	Value ($)	Percent (%) of State Total
Terminal Island	483,911,092	63.8	Terminal Island	74,668,035	58.6
San Diego	80,890,944	10.7	San Diego	21,366,707	16.8
Port Hueneme	44,030,030	5.8	Eureka	6,545,576	5.1
Eureka	26,799,272	3.5	Fort Bragg	3,445,426	2.7
San Pedro	21,636,531	2.9	Crescent City	3,229,604	2.5
Monterey	19,184,751	2.5	San Pedro	2,469,848	1.9
Moss Landing	13,642,747	1.8	Monterey	2,147,099	1.7
Fort Bragg	13,420,208	1.8	Moss Landing	1,895,835	1.5
Crescent City	13,111,971	1.7	Bodega Bay	1,583,579	1.2
Bodega Bay	12,579,217	1.7	Santa Barbara	1,558,370	1.2
San Francisco	9,192,210	1.2	San Francisco	1,528,776	1.2
Santa Barbara	7,165,858	0.9	Morro Bay	1,445,080	1.1
Morro Bay	5,649,170	0.7	Port Hueneme	1,111,707	0.9
All Other Ports	6,960,440	0.9	All Other Ports	4,459,737	3.5
Total for State	758,174,441		Total for State	127,455,379	

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[a] Source: The most recent California Marine Fish Landings published by the California Dept. of Fish and Game.

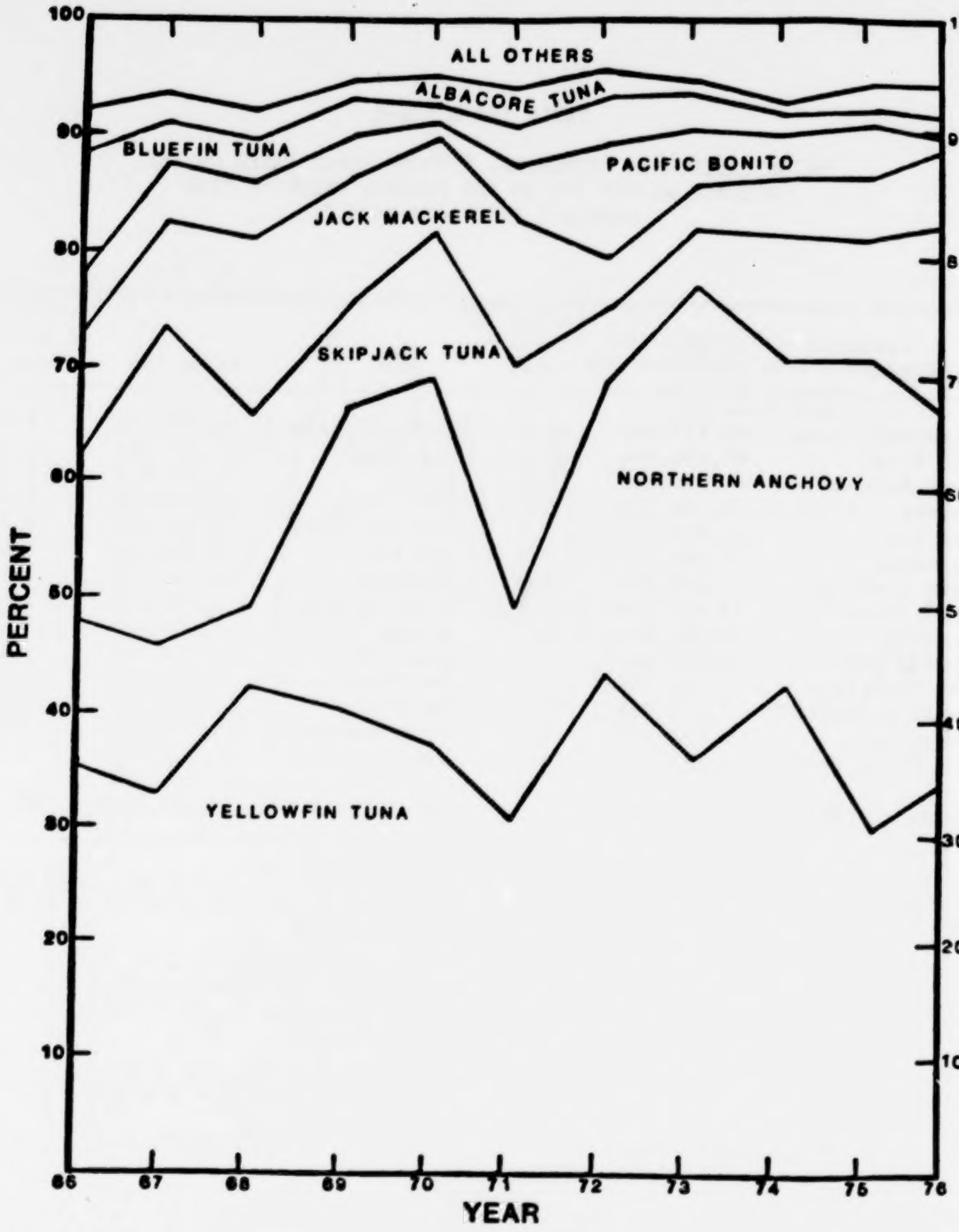

Figure III.B.3.b-2 Composition (%) of the Southern California commercial fish landings from 1966-1976 based on weight.[a]

[a]Southern California refers to CDFG's Santa Barbara, Los Angeles and San Diego areas.

Source: The most recent California Marine Fish Landings published by the California Dept. of Fish and Game.

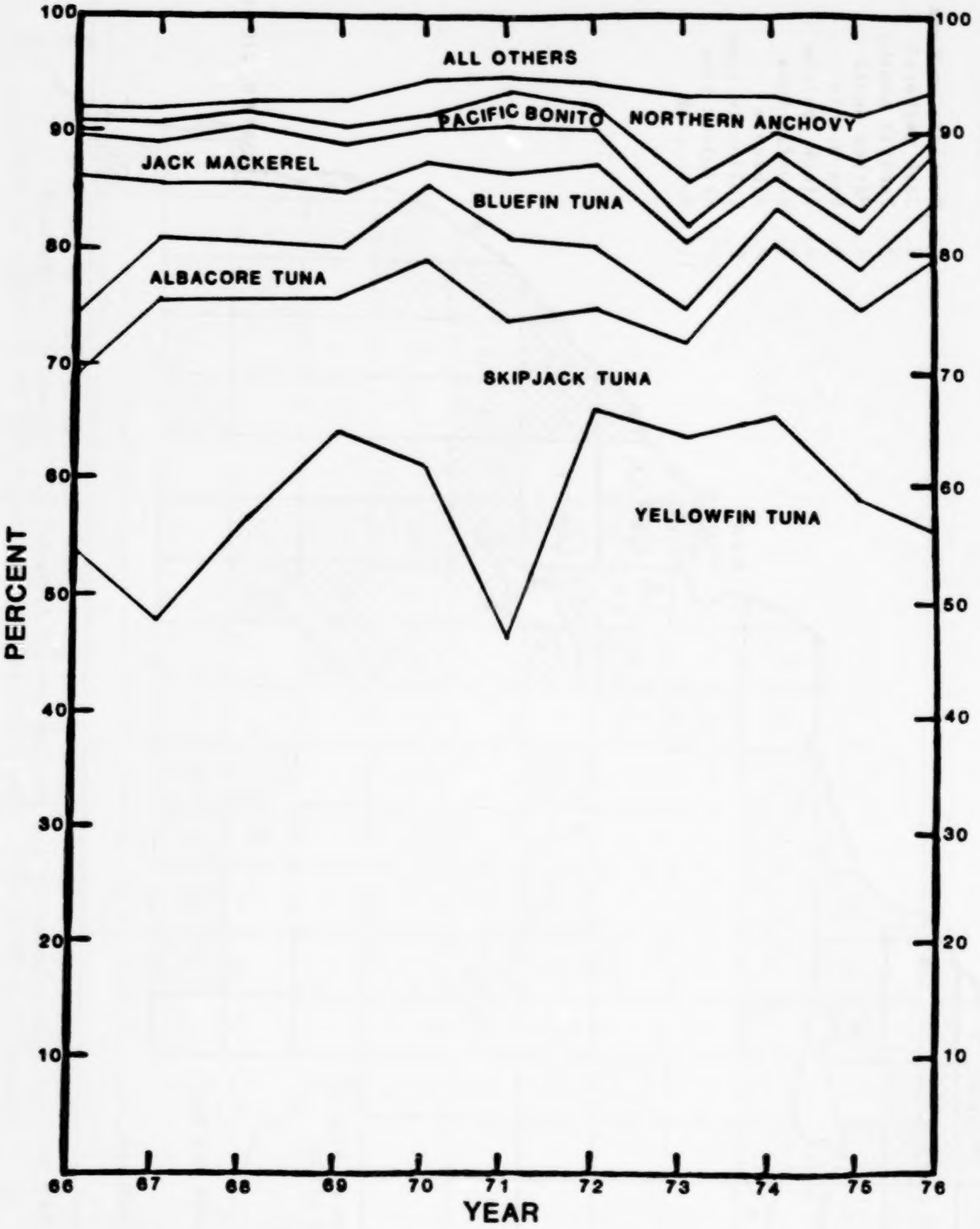

Figure III.B.3.b-3 Composition (%) of the Southern California commercial fish landings from 1966-1976 based on value.[a]

[a] Southern California refers to CDFG's Santa Barbara, Los Angeles and San Diego areas.

Source: The most recent California Marine Fish Landings published by the California Dept. of Fish and Game.

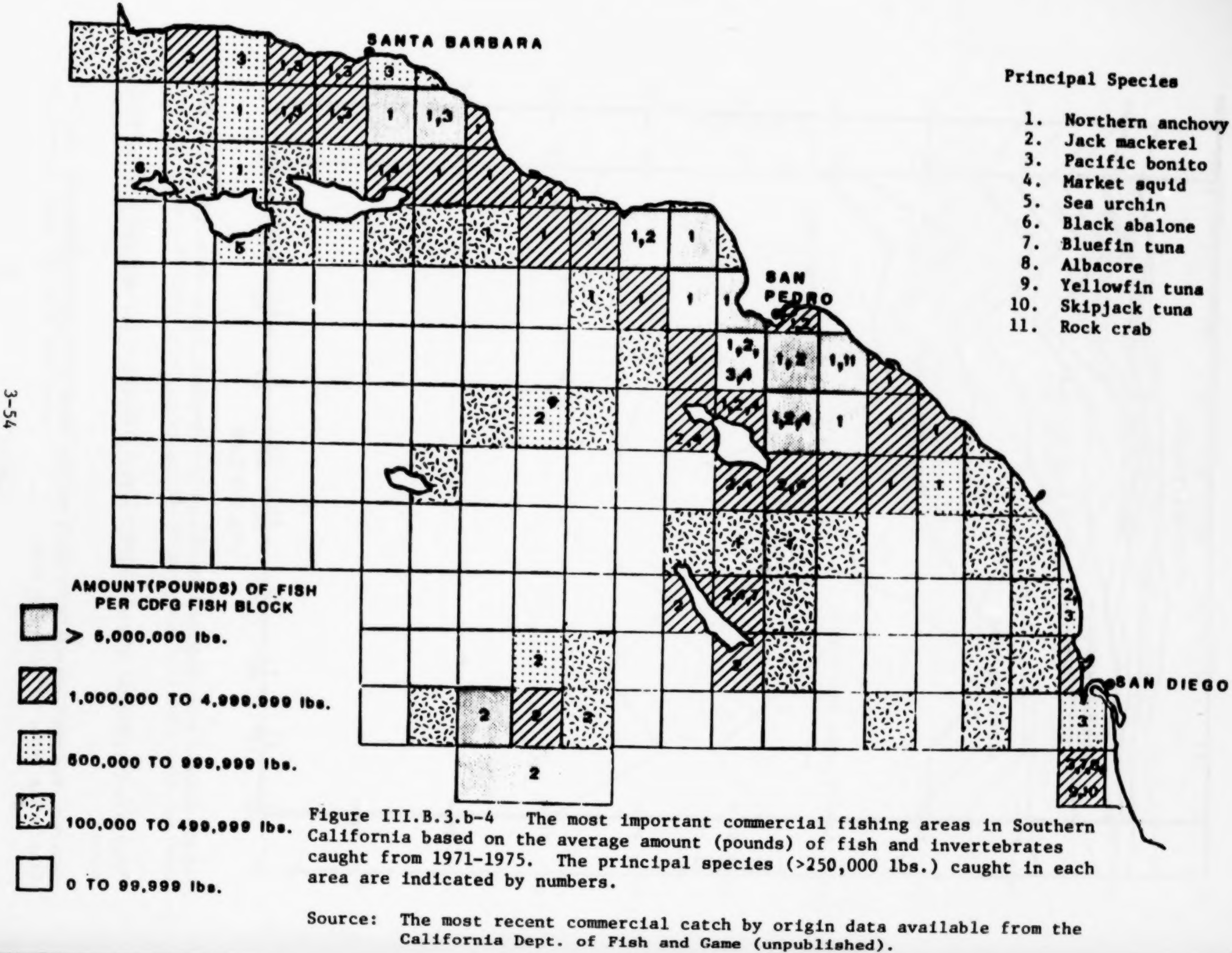
SANTA BARBARA
SAN PEDRO
SAN DIEGO
Principal Species
1. Northern anchovy
2. Jack mackerel
3. Pacific bonito
4. Market squid
5. Sea urchin
6. Black abalone
7. Bluefin tuna
8. Albacore
9. Yellowfin tuna
10. Skipjack tuna
11. Rock crab
AMOUNT(POUNDS) OF FISH PER CDFG FISH BLOCK
> 5,000,000 lbs.
1,000,000 TO 4,999,999 lbs.
500,000 TO 999,999 lbs.
100,000 TO 499,999 lbs.
0 TO 99,999 lbs.

Figure III.B.3.b-4 The most important commercial fishing areas in Southern California based on the average amount (pounds) of fish and invertebrates caught from 1971-1975. The principal species (>250,000 lbs.) caught in each area are indicated by numbers.

Source: The most recent commercial catch by origin data available from the California Dept. of Fish and Game (unpublished).

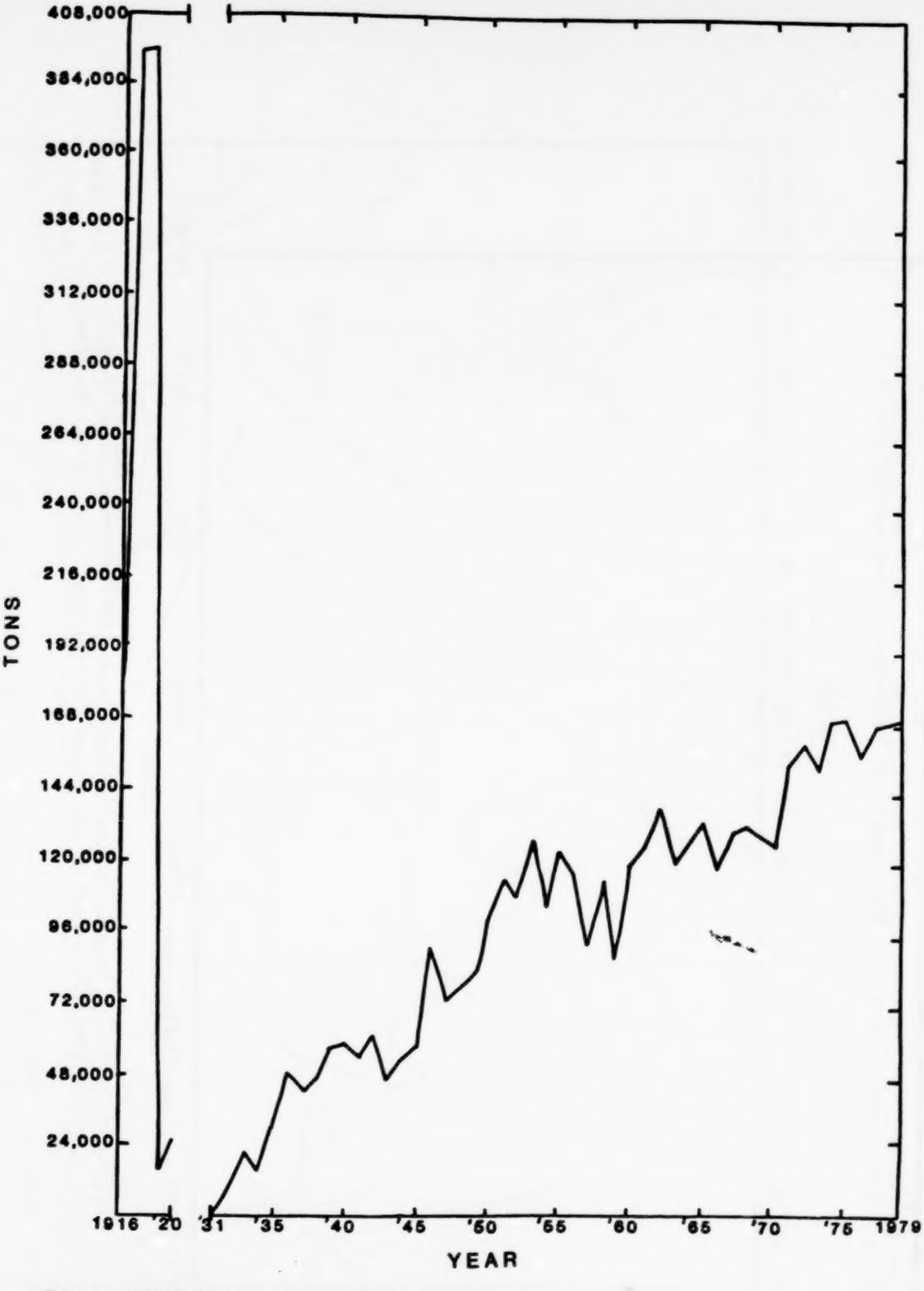

Figure III.B.3.b-5 Annual kelp harvest.

Sources: 1916-1976 data from Oliphant (1979a).
1977-1979 data from California Dept. of Fish and Game (preliminary).

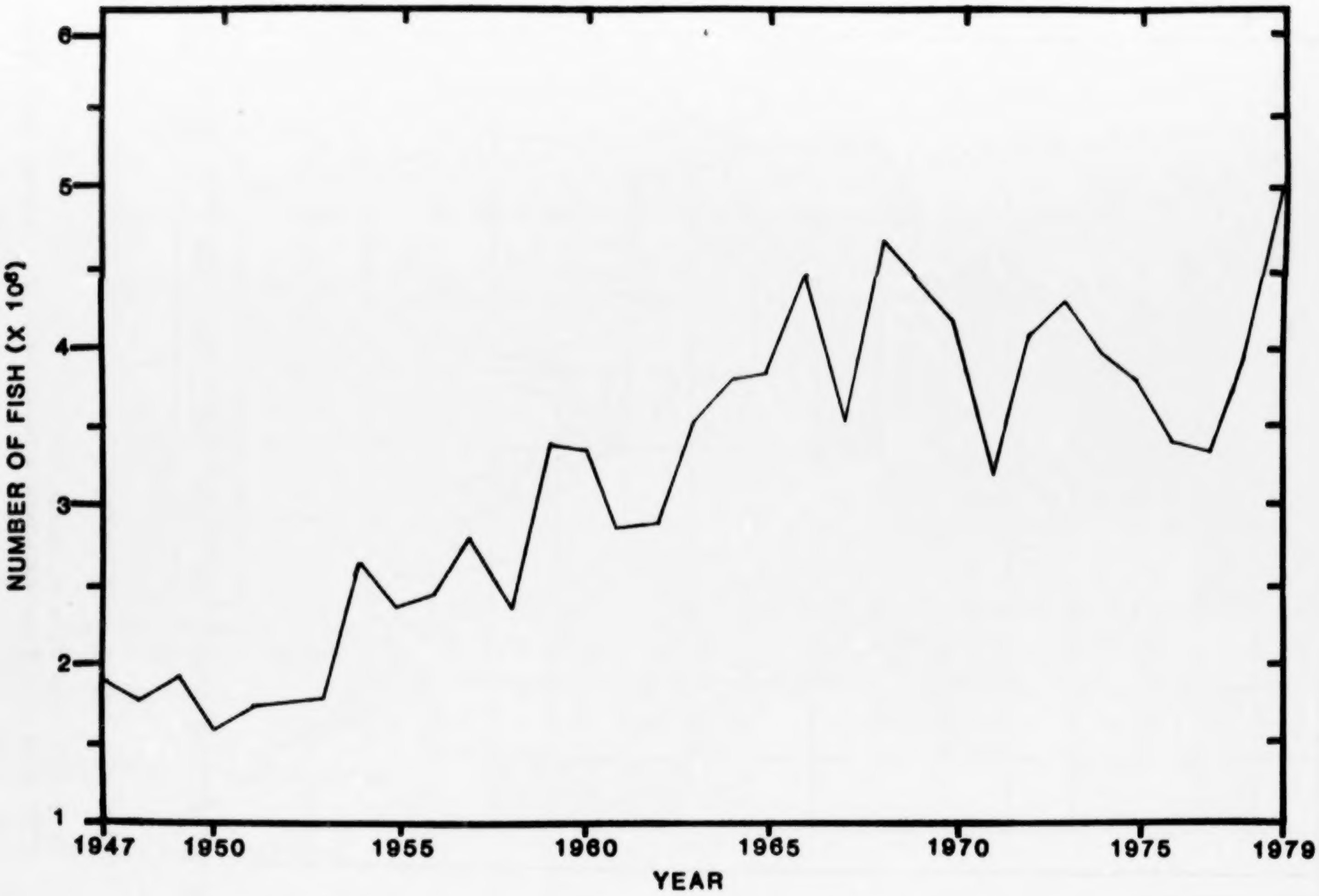

Figure III.B.3.c-1 Annual number of fish landed from Point Conception to the California/Mexico border by the commercial passenger fishing vessel fleet.

Sources: 1947-1967 data from Young (1969).
1968-1979 data from California Dept. of Fish and Game (unpublished).

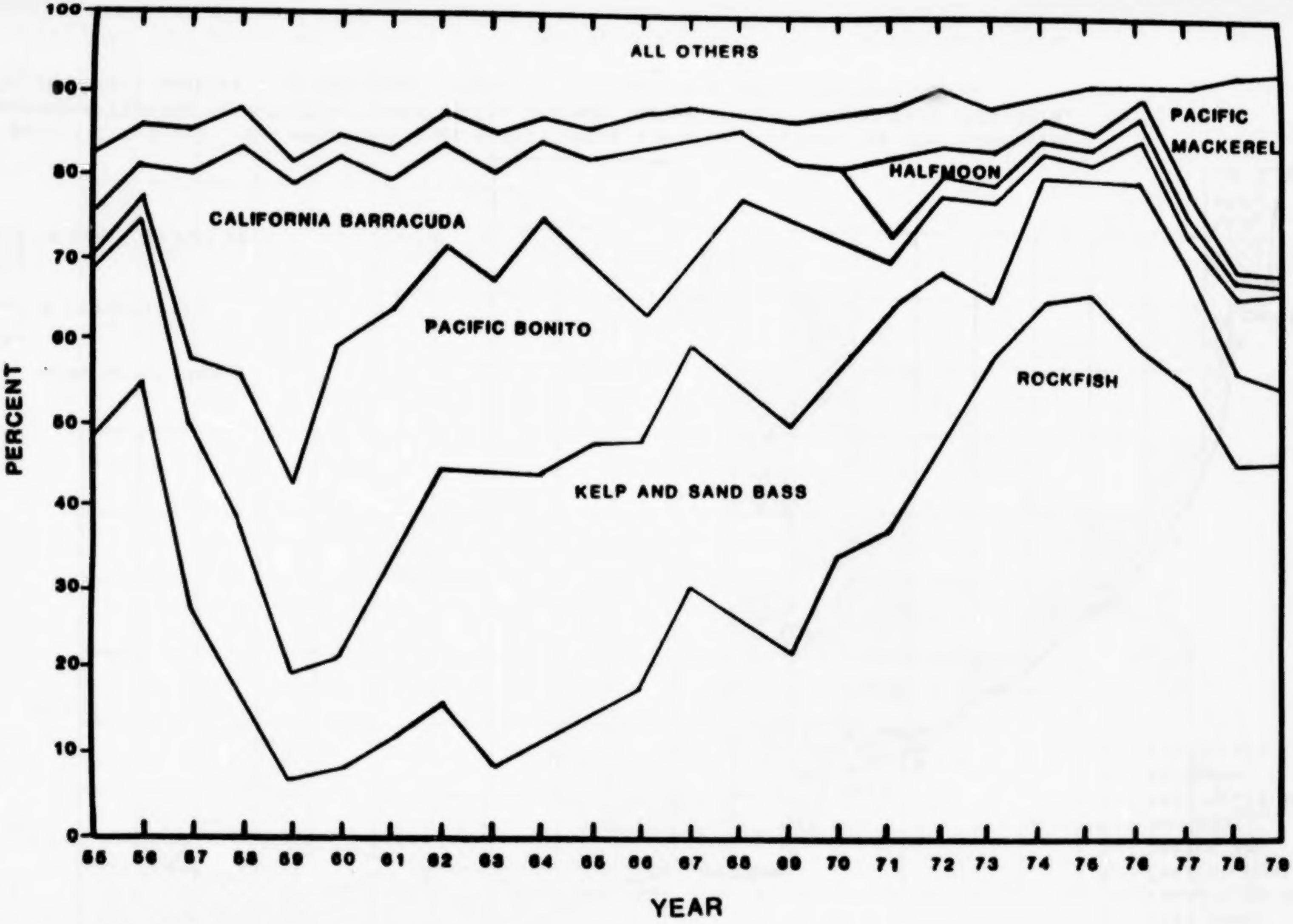

Figure III.B.3.c-2 Composition (%) of the commercial passenger fishing vessel fleet's catch between Point Conception and the California/Mexico border from 1955-1979 based on number of fish.

Sources: 1955-1971 data from Miller and Hardwick (1973).
1972-1978 data from California Dept. of Fish and Game (unpublished)
1979 data from California Dept. of Fish and Game (preliminary).

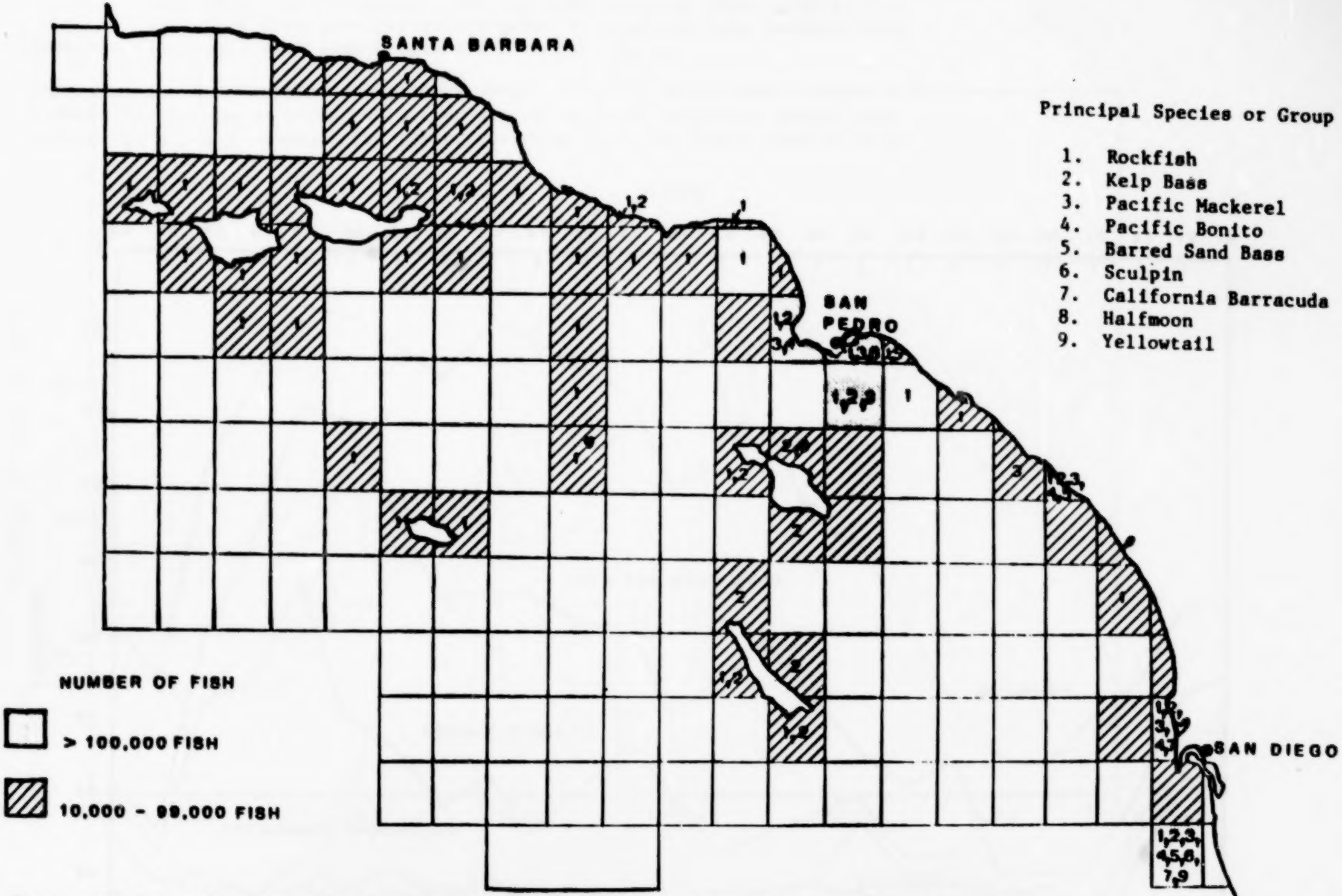
SANTA BARBARA
SAN PEDRO
SAN DIEGO
NUMBER OF FISH
> 100,000 FISH
10,000 - 99,000 FISH
Principal Species or Group
1. Rockfish
2. Kelp Bass
3. Pacific Mackerel
4. Pacific Bonito
5. Barred Sand Bass
6. Sculpin
7. California Barracuda
8. Halfmoon
9. Yellowtail

Figure III.B.3.c-3 The most important sportfishing areas in Southern for the commercial passenger fishing vessel fleet based on the average number of fish caught from 1974-1978. The principal species (>10,000 fish) caught in each area are indicated by numbers.

Source: The most recent marine sport catch data by origin available from the California Dept. of Fish and Game (unpublished).

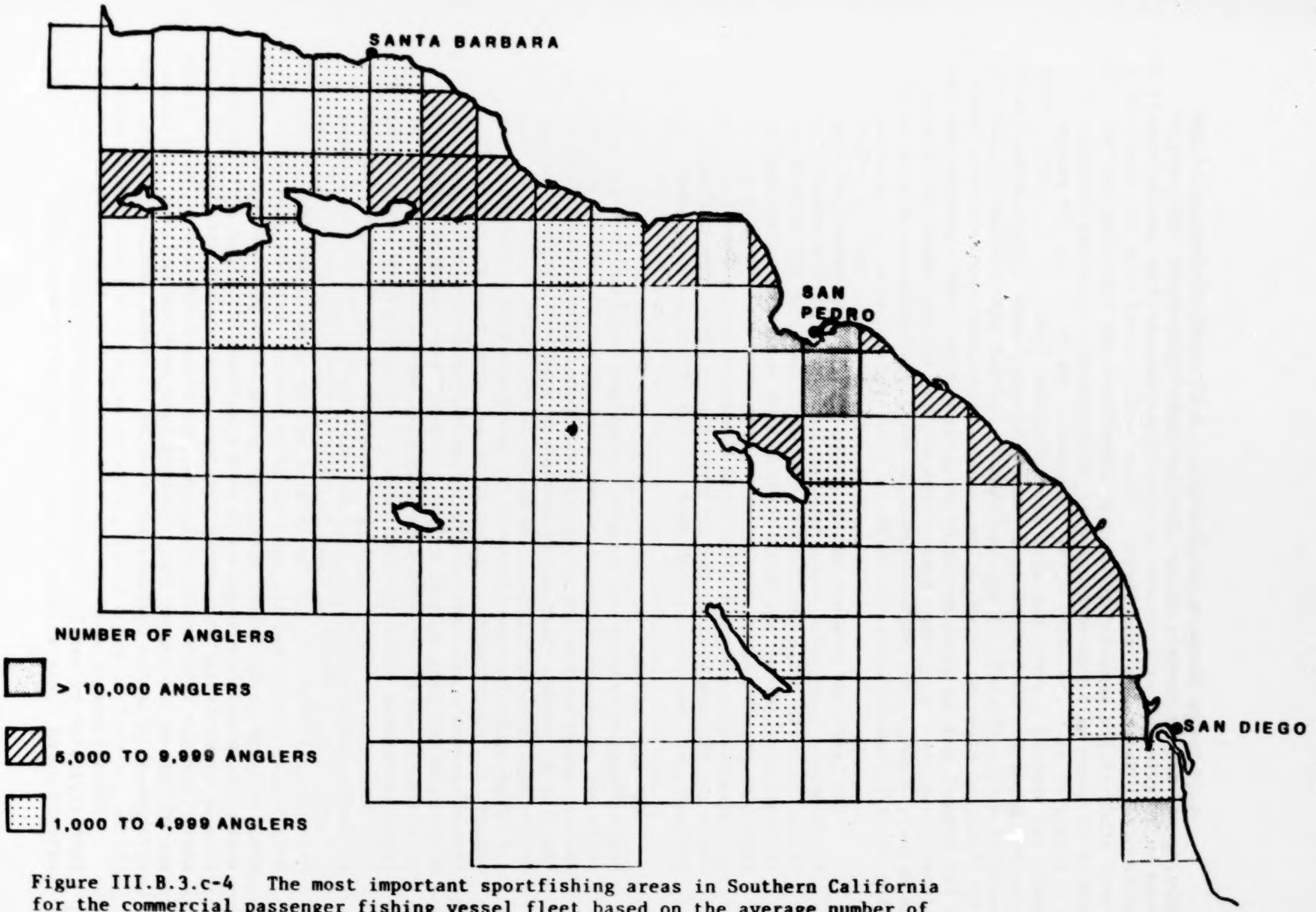
SANTA BARBARA
SAN PEDRO
SAN DIEGO
NUMBER OF ANGLERS
> 10,000 ANGLERS
5,000 TO 9,999 ANGLERS
1,000 TO 4,999 ANGLERS

Figure III.B.3.c-4 The most important sportfishing areas in Southern California for the commercial passenger fishing vessel fleet based on the average number of anglers per area from 1974-1978.

Source: The most recent marine sport catch data by origin available from the California Dept. of Fish and Game (unpublished).

4. Marine Mammals and Seabirds: A thorough discussion of the seabirds and marine mammals of the Southern California Bight (SCB) can be found in a series of publications written by scientists from the University of California at Santa Cruz and Irvine. These publications were the result of a 3-year study of the seabirds and marine mammals of the SCB funded by BLM. The authors of these 1978 publications are: Dohl, et al., a and b; Bonnell, et al.; Briggs et al.; and Hunt, et al. A summary report of the SCB marine mammal and seabird surveys has also been completed (Dohl, et al. 1980). POCS Technical Paper No. 81-6 provides a summary of the 3-year marine mammal survey completed within the SCB. A similar summary for SCB seabirds can be found in POCS Technical Paper No. 81-9. The Channel Island environmental assessment of the natural and cultural resources management plan (1980), prepared by the National Park Service, gives an excellent account of the terrestial biology of San Miguel, Anacapa, and Santa Barbara Islands. The following discussion is taken in part from Dohl, et al. 1978b.

> The large and complex marine mammal and bird community of the Southern California Bight ranks as one of the most diverse faunas in north temperate waters. Not only does the SCB support resident populations, of which several have worldwide or regional significance, but it is also an area where many wide-ranging species overlap. The SCB lies along the migration routes of important species such as the California gray whale, the northern fur seal, and many birds that pass through the area every year.
>
> The warm-blooded inhabitants of the California Current Region--marine mammals and seabirds--comprise two families of seals and sea lions (Pinnipedia) and one otter, six families of whales, dolphins, and porpoises (Cetacea), and about fifteen families of birds. Some enjoy tremendous popularity with the environmentally-aware public; many are so secretive or live so far offshore as to draw little or no attention from shorebound humans.... Environmental temperatures are very cool for warm-blooded animals, and special physiological and behavioral mechanisms for heat retention have evolved; these animals are so adept at conserving heat that when they come ashore during breeding season, as do all pinnipeds and seabirds, they may have serious problems in cooling themselves in the air and sunlight.
>
> Natural predators of the largest marine mammals are few--only killer whales and man prey on large whales--but the smaller seals and sea lions fall prey to sharks and other pinnipeds as well. Predators on seabirds are more numerous, including several terrestrial and avian carnivores and even rats and mice. Freedom from terrestrial predators and man appears to be one of the major reasons that pinnipeds and seabirds utilize offshore islands for breeding and rearing of their young.
>
> Populations of many marine mammal and seabird species have been exploited by man for centuries; overexploitation and extinction of these animals became increasingly common after

> the fifteenth century. Protection from hunting and egg collecting has led to reestablishment of some species to numbers approaching their former populations...
>
> In the three pages that follow, the marine mammal and seabird fauna of the Southern California Bight (SCB) is introduced.
>
> The Pinnipeds. Five species of pinnipeds inhabit the SCB on a regular basis. One additional species, the Guadalupe fur seal, is a rare visitor seen in summer when young males join resident sea lions and northern fur seals on their breeding grounds, and in winter when animals range farthest from their home grounds on Isla de Guadalupe, Mexico. Guadalupe fur seals were once numerous in the waters of the SCB; their bones are common in Indian kitchen middens on the offshore islands. Populations of both the Guadalupe fur seal and northern fur seal were totally extirpated from the SCB by sealers in search of pelts. Similarly, populations of California sea lions, Steller sea lions, and northern elephant seals were decimated for the oil which could be rendered from their blubber. In historic times, California sea lion populations were reduced to only a few hundred animals along the coast of California, and the northern elephant seal was considered extinct at the turn of the century, prior to its rediscovery on remote Isla de Guadalupe. Populations of the California sea lion and the northern elephant seal are now healthy and growing and are seen in great numbers on rookery islands in the SCB during their annual breeding seasons. California sea lions number over 50,000 in the SCB in summer months when pups are born, and northern elephant seals number over 12,000 in the winter when they haul out for pupping and mating. Each of these species has over 40 percent of the world population centered among the islands of the SCB. Though Guadalupe fur seals are rare in this area, their cousins, the northern fur seals, established a colony on San Miguel Island in the mid 1960s that has undergone an explosive increase in population size and pup production. Although small relative to the enormous numbers of California sea lions found on the same beaches and rocks, the northern fur seal population numbers over 4,000 at present and will soon become an important element in the SCB fauna.

The Steller sea lion population has apparently continued to drop in numbers since 1938. During this study, a few Steller sea lions were seen (never more than 20) and fewer than 10 pups were born in each of the 3 survey years (Bonnell, et al. 1978). No Steller sea lions were observered in 1980 (Bonnell, personal communications). Harbor seals haul out on all the islands in the SCB and at many locations on the mainland. The SBC population presently appears to be growing slowly, and is estimated to number 3,000 animals (Bonnell, et al. 1978).

As in the case of marine birds, pinnipeds breed and rest on the island beaches and rocks of the SCB and feed in the inshore and offshore waters. Some animals, such as harbor seals and California sea lions, commute daily from their traditional hauling grounds to open-water foraging areas over shallow island shelves and offshore banks and ridges. Northern fur seals and northern elephant seals forego hauling grounds except when necessary for breeding or molting, and reside solely in offshore waters, as at home there as the whales and porpoises.

The Cetaceans. Twenty-seven representatives of this order inhabit the waters of the SCB. Included among these are six species of baleen whales, four species of toothed whales, and seventeen species of smaller dolphins and porpoises. Cetaceans are wholly aquatic, often swimming and feeding at great depths often far offshore. Because they are not tied to shoreline breeding areas as are pinnipeds and seabirds, and infrequently beach on mainland shores, most cetaceans are very unfamiliar to people living along the coast. However, a few species, such as the California gray whale and bottlenose dolphin, are commonly seen nearshore and have attracted much public attention.

Large baleen whales feed by taking in huge mouthfuls of water and filtering out hundreds of planktonic organisms or small schooling fishes. They consume vast quantities of food and are therefore relatively scarce in the world's oceans. Several hundred years of intense whaling have further decreased their numbers. Porpoises and dolphins prey on individuals of a variety of schooling fish and squid, and may travel in herds, or pods, ranging in size from a few animals to several thousand. The food requirements of such large groups of these active, mobile animals are also very large.

Three or four cetacean species reside throughout the year within the SCB. These populations are relatively small when compared with the migratory elements of the same species that utilize the SCB seasonally. It is not yet possible to estimate the total number of young produced annually by these resident populations.

Most of the cetaceans seen in the SCB pass through during bi-annual movements; many species move inshore or toward the tropics in winter and travel to cooler, more productive waters in the summer. Predictable concentrations of these migrants are found near the northern Channel Islands in the spring and summer, along the Santa Rosa Ridge and east of San Clemente Island during summer, and along the mainland coast and near Santa Catalina Island during winter.

The Seabirds. Birds that make their living from the sea off Southern California comprise about 15 families and 80 species; they exhibit a wide array of body forms, life history patterns, and strategies for obtaining food, reproducing, and avoiding predation. Different species use the open ocean to different degrees; some stay away from land throughout the year and come ashore only for a few months to nest and rear their young, while others feed briefly at sea but remain on land for most of each day. Among the diverse strategies employed by seabirds for feeding on fish, squid, and planktonic crustaceans are: seizing prey at the surface while flying, dipping just beneath the surface, and actively pursuing prey underwater to depths as great as 80 to 100 m.

Because seabirds are awkward on land and, therefore, subject to predation by terrestrial carnivores, they usually nest on islands, occupying traditional sites year after year. In the SCB nesting colonies appear to be largest in areas free from human intrusion and island fox predation and where food resources are plentiful. Favorable wind and sun exposures combine to make colonies on northern island coasts the most "desirable" to surface-nesting species (especially cormorants and gulls), while those species that nest in burrows or vegetation (alcids) exhibit no such preference.

Of the 17 species that have nested in the SCB, four do so only on the mainland (four species of terns) and two, the Common Murre and Tufted Puffin, have ceased to nest on the islands since the turn of the century.... About 38,000 to 42,000 seabirds nest in the SCB every year.

The great majority of seabird species are not resident and either visit or migrate through the SCB on a seasonal basis. Migrating shear-waters and phalaropes number well into the millions during May and June, and almost as many birds are found in the SCB during the winter. The importance of these seasonal visitors to maintenance of stability of local populations nesting in other regions is not yet determinable. However, it is not unlikely that some seabirds are as "traditional" in their use of wintering areas as they are in selecting sites for reproduction.

The following are some of the major findings of the 3-year SCB Marine Mammal and Seabird Study (Dohl, et al. 1980).

The waters and islands of the Southern California Bight support populations of over 110 species of marine mammals and seabirds. At maximum, over 75,000 pinnipeds and a similar number of cetaceans are present in the SCB, while over 2.5 million seabirds may pass through or reside in the area at one time. The location of the SCB at the periphery of the ranges of many species marks it as a zone of overlap of faunas which are characteristic of both temperate/subarctic and subtropical waters.

Five pinniped species and eleven seabird species breed and rear their young on the California Channel Islands; small numbers of four additional seabird species nest on the Southern California mainland. The adult breeding population of pinnipeds numbers around 32,000 individuals; 20,000 young are born each year. Approximately 40,000 nesting seabirds produce about 30,000-40,000 young annually. The greatest numbers of seals and sea lions breed and pup on the west end of San Miguel Island; San Nicolas Island ranks second in importance among pinniped rookeries, followed by San Clemente and Santa Barbara islands. Nesting seabirds are also most numerous at San Miguel, followed by Anacapa, Santa Barbara, and San Nicolas islands. Smaller bird colonies are found on the larger islands.

Several pinniped and seabird breeding sites are of great worldwide or regional importance. Populations of California sea lions and northern elephant seals breeding within the SCB account for more than 40 percent of the world total of each species. San Miguel Island is the largest rookery site in the range of these species, and the only U.S. colony of northern fur seals outside the Alaskan waters. Santa Barbara Island harbors what may be the largest Xantus' Murrelet nesting colony in the world and the only U.S. nesting site for the Black Storm-Petrel. During 1975-1978 California Brown Pelicans nested in the U.S. only at Anacapa Island.

Cetacean reproductive patterns in the SCB are not well understood, although young of at least seven species (California gray whale, common dolphin, Pacific white-sided dolphin, bottlenose dolphin, northern right whale dolphin, Risso's dolphin, and pilot whale) were seen during the study; common dolphin calves were seen in all seasons.

The waters of the SCB are regionally very important, because they encompass the coastal migration route of California gray whales and the offshore routes used by the blue, humpback, and fin whales. Additionally, common dolphins, bottlenose dolphins, and pilot whales are year-round residents of the SCB.

The diet and foraging areas of two seabird species, Cassin's Auklet at San Miguel Island and Xantus' Murrelet at Santa Barbara Island, are quite restricted. Heavy dependence on northern anchovies is displayed by Western Gulls at Santa Barbara Island and Brown Pelicans at Anacapa Island.

5. Endangered and Threatened Species: Table III.B.5-1 lists the Federally listed endangered or threatened species which may be affected by the proposed sale. This list is not inclusive of other endangered, threatened, or proposed endangered or threatened species known to occur in or near coastal areas of California (see Federal Register Vol. 45 No. 77, May 20, 1980) but for which it has been determined that no effects will be sustained as a result of the proposed Sale. Such determinations have been made as part of formal and informal consultation of BLM with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, in compliance with Section 7 of the Endangered Species Act of 1973, as amended. Table III.B.5-2 lists the species recognized to be rare or endangered by the State of California.

The reader is advised to refer to Sections IV.C.6,-7,and-8 for information on the potential impacts to these threatened and endangered species.

Table III.B.5-1

FEDERALLY LISTED ENDANGERED OR THREATENED SPECIES WHICH MAY BE AFFECTED BY THE PROPOSED SALE[1]

Species	California Distribution	Status[2]
American Peregrine Falcon (*Falco peregrinus anatum*)	13 territories along coastal Calif. Between Oregon and Mexico	Endangered
Southern Bald Eagle (*Haliaeetus l. leucocephalus*)	Mainly in interior Calif. Some found along the coast	Endangered
California Brown Pelican (*Pelecanus occidentalis californicus*)	Statewide along coast. Breeding only on Anacapa Island and Scorpion Rock in So. California	Endangered
California Least Tern (*Sterna albifrons browni*)	San Francisco Bay to Mexico (Breeding)	Endangered
Light-Footed Clapper Rail (*Rallus longirostris levipes*)	Salt marshes of Santa Barbara, Ventura, Orange, and San Diego Counties	Endangered
California Condor (*Gymnogyps californianus*)	San Luis Obispo Co.; Santa Barbara Co.; Sespe-Piru area of Ventura and Los Angeles Co.	Endangered
San Clemente Loggerhead Shrike (*Lanius ludovicianus mearnsi*)	San Clemente Island	Endangered
San Clemente Sage Sparrow (*Amphispiza belli clementae*)	San Clemente Island	Threatened
Santa Barbara Song Sparrow (*Melospiza melodia graminea*)	Santa Barbara Island	Endangered
Blue Whale (*Balaenoptera musculus*)	Offshore	Endangered
Fin Whale (*Balaenoptera physalus*)	Offshore	Endangered

TABLE III.B.5-1 (Cont.)

Species	California Distribution	Status[2]
Gray Whale (*Eschrichtius robustus*)	Offshore and normally within 15 km of the mainland shore	Endangered
Humpback Whale (*Megaptera novaeanglinae*)	Offshore	Endangered
Pacific Right Whale (*Eubalalena glacialis japonica*)	Offshore	Endangered
Sei Whale (*Balaenoptera borealis*)	Offshore	Endangered
Sperm Whale (*Physeter catodon*)	Offshore	Endangered
Southern Sea Otter (*Enhydra lutris nereis*)	Santa Cruz south to Avila Beach	Threatened
Leather-backed Turtle (*Dermochelys coriacea sechlegeli*)	Tropical and sub-tropical seas of west coast; some stray as far north as Vancouver Is., British Columbia	Endangered
Loggerhead Sea Turtle (*Caretta caretta*)	Offshore	Threatened
Green Sea Turtle (*Chelonia mydas*)	Offshore	Endangered
Island Night Lizard (*Klauberina riversiana*)	San Clemente Island	Threatened
El Segundo Blue Butterfly (*Shijimiaeoides battoides allynia*)	Los Angeles Co. Coastal Area near L.A. Airport	Endangered
Palos Verdes Blue Butterfly (*Glaucopsyche lygdamus paloverdesensis*)	Palos Verdes Pennisula, Los Angeles County	Endangered
San Clemente Island Broom (*Lotus scoparius* ssp. *traskiae*)	San Clemente Island	Endangered
San Clemente Island Larkspur (*Delphinium kinkiense*)	San Clemente Island	Endangered
San Clemente Island Bushmallow (*Malacothamnus clementinus*)	San Clemente Island	Endangered
San Clemente Island Indian Paintbrush (*Castilleja grisea*)	San Clemente Island	Endangered
Santa Barbara Island Liveforever (*Dudleya traskiae*)	Santa Barbara Island	Endangered
Salt Marsh Bird's Beak (*Cordylanthus maritimus ssp. maritimus*)	Coastal Marshes of Santa Barbara, Ventura Orange and San Diego Counties	Endangered
Monoplacophoran Limpet (*Vema hyalina*)	Southern Santa Rosa - Cortes Ridge; 174-402 m	Proposed Endangered

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[1] As determined through consultation with U.S. Fish and Wildlife Service and National Marine Fisheries Service in compliance with Section 7 of the Endangered Species Act of 1973, as amended.

[2] Per Federal Register, 20 May 1980, Vol. 45, No. 97.

TABLE III.B.5-2

SPECIES DESIGNATED AS RARE OR ENDANGERED BY THE STATE OF CALIFORNIA

Species	Distribution	Status[1]
Guadalupe Fur Seal (*Arctocephalus townsendi*)	San Miguel Island	Endangered
Island Fox (*Urocyon titloralis*)	All SCB Islands except Anacapa and Santa Barbara	Rare
Belding's Savannah Sparrow *Passerculus sandwichensis beldingi*)	Santa Barbara, Ventura, Orange & San Diego County Coastal Marshes	Endangered
California Black Rail (*Laterallus jamaicensis coturniculus*)	Santa Barbara, Ventura, Orange & San Diego County Coastal Marshes	Rare

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[1] *At The Crossroads 1978*. State of California. Department of Fish and Game.

6. Sensitive Biological Areas

a. Estuaries and Wetlands: California is notable in having coastal embayments developed on a smaller scale than its counterpart area of the East Coast. This is particularly true of the coast of Southern California, where, because of arid climate and rather recent geological setting, there is no large river entering the sea. Consequently, most bays on the coast of Southern California are small. Furthermore, the absence of a coastal plain in Southern California has restricted the development of salt marsh to small areas bordering sheltered bays and lagoons.

Detailed coverage of the biological aspects of estuaries in Southern California can be found in Ju-Shey Ho (1974) Department of the Interior (1975, 1978b, 1978c). There are many good references of estuaries, in general, and of California in particular, including Jones and Stokes (1980).

The great influx of residents to Southern California during and following World War II, resulted in substantial alteration of the natural state of the southland. Nearly all of the bays and lagoons have been modified by the activities of man through construction of marinas and breakwaters, building of roads and railroads, dredging of channels, diversion of rivers, and use for waste disposal. Of the existing embayments, Mugu Lagoon, Anaheim Bay, Upper Newport Bay, and Tijuana Estuary are some of the few major embayments that still remain in a relatively unaltered condition.

Estuaries and lagoons support animals recruited principally from the sea. Many neritic animal species use these areas as a nursery ground before migrating to the open sea (Vernberg and Vernberg, 1972). For example, shallow-water fishes such as the California halibut, the Pacific staghorn sculpin, the deepbody anchovy, and the gray smooth-hound are known to use Anaheim Bay as nursery habitats. Some permanent dwellers of Anaheim Bay that complete their life cycle in the bay are the topsmelt, the California killifish, the arrow bogy, and the diamond turbot.

However, with a profound alteration of coastal wetlands in Southern California, the extent they still serve as a nursery and feeding ground for neritic animals has not been determined. It is known that the fully developed commercial and residential marina-complex in Mission Bay has destroyed most, if not all, wildlife values there (Speth, 1969). Studies on the benthic animals of Anaheim Bay by Kawuling and Reish (1975) have demonstrated that the density of benthic polychaetes showed striking differences between the dredged and the undredged areas.

With the extreme alteration of much of the estuarine habitat of Southern California, coupled with the fact that some estuaries still function as nursery and feeding areas for important coastal fish, the remaining estuarine areas take on added importance to coastal ecology.

No two estuaries are alike and some generalizations are not true for certain estuaries. Nevertheless, estuaries typically have certain types of major habitats which are occupied by most of the same dominant species, or at least ecological equivalents, even though the distributions and relative amounts of these habitats and associated species (particularly those with smaller populations) may differ.

The following overview of the habitats typical of the estuaries in California was taken primarily from the final draft of Jones and Stokes (1980); although the habitat classification was slightly modified to follow that used by California Fish and Game (1973). The major habitats of estuaries are: open water, tidal flats, including mudflats and sandflats, and eelgrass subtidal areas. Other important areas are the hard or rocky bottoms.

The tidal flat communities (sand and mud) are dominated by similar types of organisms. The primary producers are algae, including both microscopic diatoms and macroalgae (mudflats). The invertebrate fauna is characterized by two types of organisms: those living on the substrate (epifauna) and those living in the substrate (infauna). The epifauna includes snails, nematodes, crustaceans, and polychaete worms. The infauna includes bivalves, polychaete worms, crustaceans, and echiuroid worms. The fish community associated with sand and mudflats consists largely of bottom fish, including flounders, gobies, rays, and sharks. A number of species of birds feed intertidally, especially on mudflats during low tide.

Mudflat. The problems of respiration and feeding, and lack of attachment sites in the soft substrate of mud bottoms favor a specialized fauna. The mudflat community is composed of both epifaunal and infaunal organisms. Sunlight is converted into organic matter by the diatoms and algae, growing on the surface of the mud. Detritus produced within the community and transported from other habitats provides a major food source. Some herbivorous species and many small organisms graze on the algae. A few predatory species feed upon the mud surface, but most of the community is found within the mud. Adaptations to feeding include: living in burrows and filtering food particles from the water, or ingesting mud and extracting food. The birds and fish that feed on the mudflat may capture food on the mud surface or probe the mud. Most filter feeders construct burrows in the mud, while invertebrate predators feed on the surface of the mudflat or plow through the mud. Most fish that feed on mudflats are bottom fish. Mudflats are extremely important bird feeding areas and are utilized by numerous species.

The mudflat community is visited by many predatory species at different tidal stages. Various fish species remain in deeper channels during low tides, moving onto the mudflats to feed during high tides. The exposure of the intertidal mudflats at low tide allows many bird species to feed there. Shallow subtidal mudflats are also accessible to birds during low tide.

Tidal action carries nutrients from other habitats onto the mudflats. Detritus imported from the rocky bottom habitat and from the emergent vegetation habitat helps enrich the mudflats. Tidal currents are also important as a means of dispersal for sedentary organisms, which release planktonic larvae to be transported to other habitats or areas by this method.

Sandflat. Shifting of the sandlfat substrate generally excludes primary producers from the habitat. The inhabitants of the sandflat community rely upon nutrients imported from other areas. Tidal action carries plankton and suspended organic matter onto the sand flats, supporting the filter feeders and deposit feeders. Organisms are eaten by invertebrate predators, fish, and birds. Organisms migrate into the sandflat community in the same pattern as noted for mudflats. Fish move onto the sandflats to feed primarily during high tide, with birds foraging over the sandflats at low tide.

Open Water - Water Column. The open water community is dominated by pelagic organisms. The primary producers are members of the phytoplankton community, largely single-celled diatoms. The zooplankton community is dominated by copepods, but also includes other crustaceans, and the larvae of mollusks, crustaceans, and fish. Adult pelagic fish include anchovy, herring, smelts, silversides, and several anadromous species. Some of these species use the estuary on a seasonal basis, while others are resident species. A number of birds inhabit or feed in the open water environment. These birds include those that swim on the surface and those that dive from the air.

The open water community relies upon phytoplankton to convert sunlight into organic matter. Members of the zooplankton community feed on phytoplankton and suspended detritus.

The zooplankton community is an assemblage of many different types of organisms. Zooplankton can be divided into two major components, the holoplankton and the meroplankton. Holoplankters (permanent plankton) complete their entire life cycle as planktonic organisms. Meroplankton spend only a portion of their life cycle as planktonic organisms and include essentially all the important invertebrates of other habitats and many important fish species which utilize estuaries as a breeding ground or nursery ground.

Phytoplankton and zooplankton are consumed by many fish. Some of the fish may abandon their pelagic habits, at times, in order to move to the bottom and feed. Open water birds are almost entirely dependent on fish, feeding primarily on pelagic species.

Eelgrass Beds. Eelgrass beds may be present on a variety of substrates, occurring intertidally and subtidally. In addition to the quiet waters of an estuary, the primary factors governing the occurrence of eelgrass beds appear to be tidal exposure and light penetration. Eelgrass is not tolerant of extended periods of exposure to air, which determines its upper limit in the intertidal zone. The lower limit is determined by light penetration, which is largely dependent on water clarity. In turbid waters, eelgrass beds are rarely found below a depth of 3 to 4 meters.

Sunlight is converted into organic matter primarily by the eelgrass with a lesser contribution by epiphytic diatoms and algae. Many herbivorous species graze directly on the eelgrass or feed on the epiphytes. The root systems of eelgrass trap sediment, including organic detritus. This material along with dead and decaying eelgrass leaves, supports scavengers and detrital feeders. Some filter feeders exist within the substrate, while others occur as epiphytes on the eelgrass leaves. These organisms feed on plankton and suspended detritus carried into the eelgrass habitat by tidal currents. The various predators feed on the grazers, scavengers, and filter feeders. Eelgrass beds are generally located in the subtidal zone. Constant submergence of the beds favors visitation of this habitat by fish. In addition to seeking food and protection within the eelgrass beds, many fish attach their eggs to the leaves of eelgrass.

Eelgrass beds are highly productive. Surplus energy in the form of dead plant leaves is exported to other habitats, including the salt marsh, mudflats, and rocky bottom. The eelgrass beds are efficient in trapping sediment and detritus carried in from other habitats.

Salt Marsh. Intertidal emergent vegetation (i.e., salt marsh) is inhabited by specifically adapted aquatic vegetation and fauna. Sparse to dense stands of grasses, sedges, rushes, and succulent vegetation, varying in height from nearly prostrate to two meters, are the visually dominant life forms.

Vascular halophytes dominate the salt marsh habitat both with respect to standing crop (biomass) and to percentage cover. Two of the most important species in California are California cordgrass (Spartina foliosa) and pickleweed (Salicornia bigelovii). The former grows along creek banks and elevations from mean high water (MHW) to mean higher low water (MHLW). Salicornia extends from below MHW, nearly to MHHW (Hinde, 1954).

Several other species typical of Southern California include Suaeda californica (seablite), Monanthochloe littoralis (shoregrass), and Distichlis spicater (saltgrass).

Above the Zosteretum, in Upper Newport Bay, Stevenson and Emery (1958) identified five additional zones: Spartinetum, Salicornietum, Suaedetum, Monanthocloetum, and Distichlidetum. Each zone was named after the dominant species that occurred in it. However, in Anaheim Bay, Baker (1975) could identify only three additional zones: Spartinetum, Batietum/Salicornietum, and Distichlidetum.

It is noted that in San Elijo Lagoon (Anonymous, 1972b) and other periodically closed small lagoons in San Diego County, the typical salt marsh grasses, e.g., cordgrass, pickleweed, arrowgrass, Triglochin maritima; saltwort, Batis maritima; and eelgrass, of the permanently submerged zones in Southern California are absent. This absence is apparently associated with the absence of continuous tidal flushing in these lagoons.

There are four main food chains. One consists of the primary consumers grazing on vascular marsh plants, such as cordgrass, and pickleweed. The herbivores feed directly on the leaves, shoots, and seeds of the plants and include rabbits, meadow mice, and several species of ducks. This chain would be well developed in Anaheim Bay and Mugu Lagoon, for example, but less well developed in more established areas, as the Ballona Creek area in Los Angeles County.

A second grazing food chain is supported by the benthic algae and includes more aquatic than terrestrial organisms. Nematodes, foraminifera, ostracodes, amphipods, annelids, bivalves, and gastropods feed on diatoms and other microscopic algae. Several gastropods, snails, and several fish, including topsmelt and longjaw mudsucker, feed on the larger benthic algae.

A third grazing food chain, supported by phytoplankton during periods of tidal submergence, includes herbivorous zooplankton.

The last major source of energy is the detrital food chain, which has been found to possess a greater community energy flow than the grazing food chains (Teal, 1962). Decaying plant material provides the medium and substrate for bacteria and microbiota action. These micro-organisms are food for higher organisms. They also break down complex organic compounds to simpler forms, more usable by other organisms.

Detritus feeders in the marsh are many. Nematodes, ostracodes, many species of insects, and marine macroinvertebrates, such as the polychaete worms. Mollusks and crustaceans such as shore crabs (Hemigrapsus), fiddler crabs (Uca crenulata), and amphipods rely on detritus as their major source of nourishment.

The dominant plants of a salt marsh support a diverse, largely terrestrial herbivore community, including herbivorous insects, birds, and small mammals which feed directly on the leaves, shoots, or seeds. However, a substantial portion of the biomass produced is not consumed directly. Oxidation of decaying plant parts occurs by micro-organisms which form a detrital food chain.

The salt marsh is the most important food producing area within the estuary, particularly the smaller ones without large eelgrass beds. Being highly productive, the marsh exports large quantities of detritus to adjacent ecosystems. The detritus may be transported to adjacent mudflats or other estuarine habitats for consumption by deposit feeders or may remain in suspension where it is available for use by filter feeders and open-water zooplankton.

Some of the detritus reaches the nearshore oceanic areas where it plays a role in the food web there. This contribution is secondary to upwelling in California, however.

Rocky Bottom. Rocky bottoms, present primarily along headlands in some estuaries, and at the entrances to bays, are similar in species composition to shallow subtidal and intertidal areas of the oceanic coastal environment. Jetties and other artificial structures in estuaries near large human populations have a similar species composition and add to the areal representation of this habitat with the resulting increase of hard bottom species.

Many organisms move in and out of the rocky bottom habitat. Wading and shore birds, and fish may utilize this habitat during certain tidal stages; birds preferring low tides and fish high tides. These and other predators may be particularly evident in the rocky habitat during calm periods.

The rocky habitat exports detritus in the form of plant and algal particles to other habitats. Plant detritus enters the rocky habitat from other environments. The influx of phytoplankton and zooplankton from the open water habitat is extremely important as food supply.

Rocky intertidal habitats are discussed further in Section III.B.2.a.

Entrance Widths. An estimation of entrance widths of important estuaries is shown in Table III.B.6.a-1. The "normal" entrance width was obtained from California Fish and Game personnel (personal communication) or the openings as mapped on U.S. Geological Survey 7½' quad maps. Maximum openings, obtained

TABLE III.B.6.a-1

WIDTH OF ENTRANCE OF THE IMPORTANT ESTUARIES IN THE SOUTHERN CALIFORNIA BIGHT

(All numbers are metric meters: S-small opening 1 to 10 meters)

Estuary	Width of Entrance	
	Normal	Max.-Min.
Devereaux Slough	0	S - 0
Goleta Slough	S	400 - 0
Carpinteria Marsh	S	30 - 0
Mugu Lagoon	30	800 - 30
Ventura River	0	S - 0
Santa Clara River	0	S - 0
Malibu River	S	S - 0
Ballona Creek	30	30 - 30
Anaheim Bay	200	200 - 200
Cerritos Marsh	S	S - S
Santa Ana River	S	S - 0
Newport Bay	225	225 - 225
San Mateo Creek	30	150 - 0
Santa Margarita River	S	200 - S
San Luis Rey River	S	S - 0
Buena Vista Lagoon	S	200 - S
Agua Hedionda	90	900 - 90
Batiquitos Lagoon	S	450 - 0
San Elijo Lagoon	0	1200 - S
Los Penasquitos Lagoon	S	520 - 0
Mission Bay	250	250 - 250
San Diego Bay	690	690 - 690
Tijuana River	S	80 - S

from the same source, were estimated based on two assumptions. 1) The entire fronting spit bar may be breached (or washed away) during winter and spring flood conditions coupled with high tide and storms; 2) The entire valley at the mouth may be flooded and open when the entrance lies within a definite valley closely bordered by topographic highs. The former assumption is valid and is typical while the latter rarely occurs, perhaps only occurring during extremely rainy years within several of the estuaries. Therefore, these represent extremely conservative estimates of the maximum flooding possible. The minimum openings and the dimensions of major habitats were obtained from California Fish and Game (1973), Fish and Game Wetland series, Fish and Game personnel, particularly Earl Lauppe (personal communication, 1981).

b. Areas of Special Biological Significance, Reserves, Preserves, and Other Sensitive Areas: Five main types of areas are described in this section. They are not all unique, literally, but all are of biological importance. The five types are: 1) Ecological Reserves, 2) Marine Life Refuges, 3) Area(s) of Special Biological Significance (ASBS), 4) unique biological areas, and 5) biologically sensitive areas (not already covered in the other categories). The first three are legally defined and controlled by the State of California. It should be noted that the terms Reserve and Marine Reserve are used in addition to Ecological Reserve. The three categories are very similar; however, there are more restrictions and controls in an Ecological Reserve. The purpose of the refuges and reserves is to reduce the abuse and waste of the State's tide pool resources by restricting general collecting of all animals living in tide pools and other areas between the high tide mark and 1,000 feet below the low tide mark. From Point Conception to the U.S.-Mexican Border, there are seven Ecological Reserves, nine Marine Life refuges and fifteen Area(s) of Special Biological Significance. There are seven Ecological Reserves, three Marine Life Refuges, and fifteen Areas of Special Biological Significance (ASBS) between Point Reyes and Point Conception (Table III.B.6.b-1). Some of the Ecological Reserves and Marine Life Refuges have also been designated ASBSs. Ecological Reserves, Marine Life Refuges, ASBSs, unique and sensitive biological areas are defined and further discussed in U.S. Department of the Interior (1978a,b).

7. Proposed National Marine Sanctuaries: There are two designated National Marine Sanctuaries offshore California, the Farallon Islands and the Channel Islands. A third area, Monterey Bay, is under study. Implementing regulations for the Channel Islands became effective on March 30, 1981. However, regulations pertaining to hydrocarbon activities were suspended and an analysis of the sanctuary regulations, relative to oil and gas development, is being conducted. Depending upon the results, drilling may or may not be allowed within the boundaries. The Channel Islands Sanctuary is the only one in (or even near) the proposed Sale No. 68 area. It consists of the ocean area, from the high tide line seaward to a distance of 6 nmi, around San Miguel, Santa Rosa, Santa Cruz, Anacapa and Santa Barbara Islands. For further information see the following: FEIS for OCS Sale 48 (U.S. Department of the Interior 1978), FEIS on the Proposed Channel Islands Marine Sanctuary (U.S. Department of Commerce, May 1980), The General Management Plan Channel Islands National Park (National Park Service, September, 1980) and Section II.B.2.

TABLE III.B.6.b-1

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE IN THE SOUTHERN CALIFORNIA BIGHT. ASBS - AREA OF SPECIAL BIOLOGICAL SIGNIFICANCE. ER - ECOLOGICAL RESERVE, REFUGE, PRESERVE, S - BIOLOGICAL SENSITIVE OR UNIQUE AREAS NOT ALREADY COVERED BY OTHER CATEGORIES

Abalone Cove Ecological Reserve	
Bolsa Chica Ecological Reserve	
Heisler Park Ecological Reserve	ASBS
Farnsworth Bank Ecological Reserve	
Buena Vista Lagoon Ecological Reserve	
San Diego - La Jolla Ecological Reserve	ASBS
Point Loma Reserve	
Point Fermin Marine Refuge	
Newport Beach Marine Life Refuge	ASBS
Irvine Coast Marine Life Refuge	ASBS
Laguna Beach Marine Life Refuge	
South Laguna Beach Marine Life Refuge	
Niguel Marine Life Refuge	
Dana Point Marine Life Refuge	
Doheny Beach Marine Life Refuge	
San Diego Marine Life Refuge	ASBS
San Miguel Island	ASBS
Santa Rosa Island	ASBS
Santa Cruz Island	ASBS
San Nicolas Island	ASBS
Begg Rock	ASBS
Santa Barbara Island	ASBS
Anacapa Island	ASBS
San Clemente Island	ASBS

Santa Catalina Island including the following subareas:
- Subarea 1 Isthmus
- Subarea 2 North end of Little Harbor to Ben Weston Point
- Subarea 3 Farnsworth Bank
- Subarea 4 Binnacle Rock to Jewfish Point

Mugu Lagoon to Latigo Point	ASBS
San Nicolas Island - northwest end	S
Tanner and Cortes Banks	S
Santa Rosa - Cortes Ridge - 100 m. to 500 m. depth	S
Castle Rock - San Clemente Island	S
Santa Rosa Island - north shore	S
San Clemente Island - outer coast	S

8. Terrestrial Resources: In this discussion, biomes are being used to delineate the land vegetation rather than small patchily distributed plant communities. The latter are smaller entities within the larger more inclusive vegetation biomes. An overview of vegetation biomes of the Southern California borderland is shown in Figure III.B.8-1.

The Woodland-Brushland Biome is variable with three vegetation types; California chaparral, forest vegetation, and riparian woodland, often intermixed within very close geographical areas (Bureau of Land Management, 1973). Some biome exists as a sub-climax stage of the coniferous forest; the forests having originally been destroyed by forest fires, timbering, and other man-made alterations.

The vegetation, though variable, is typically adapted to withstand summer periods of drought. The most prevalent vegetation association, comprising about 50 percent of the biome, is California chaparral occurring predominantly in the drier areas having a maximum of 28 cm (11 inches) of precipitation a year. The most common plants of the chaparral include: chamise, toyon, several species of *Ceanothus*, manzanita, and scrib oak. These plants often occur in densities which make the areas impenetrable by all but small animals.

The forest vegetation type generally consists of scrib oak, island oak, toyon, ironwood manzanita, and chamise. Another common vegetation type is the riparian woodland (associated with stream or river courses, lake or tideland). Common plants are willows, alders, blackberry, creek dogwood, blue elderberry, nettles, various ferns, and cottonwood.

Because the mainland woodland-brushland biome is so widespread and has such a wide variety of vegetation, the wildlife is represented by a long list of species. No one species is unique to any one vegetation type or representative of the biome. The dominant mammal of the biome is the California mule deer. The mule deer is found near the coast in Santa Barbara and Ventura counties. The black-tailed deer is common throughout the remainder of the area.

The species using the woodland-brushland habitat which are threatened with extinction are the California condor, Southern bald eagle, and peregrine falcon.

The grassland biomes of Southern California vary from tall dense grasses to low sparse grass. Most of the native grasses (commonly the bunch-grass type) have been replaced by introduced species such as wild oats. The species composition is varied from area to area depending on soil and water conditions.

The animals of the mainland grassland biome are much the same species which occur in the woodland-brushland biome except that there are fewer deer and no black bears or cougar. Another exception is a greater variety of rodents, burrowing animals, and raptorial birds.

The species on the Channel Islands are apparently similar to those of the mainland, although Laughrin (1973) reports several endemic species (species located only on these islands). On the steep walls and cliffs of island canyons, but out of reach of the persistent goats, precariously remain some of the unique and interesting island endemics such as the tree dandelion (*Manzothamun blairii*), island snapdragon (*Galvezia*), island buckwheat (*Eriogonun giganteun*), and monkey flower (*Mimulus flemingii*).

More detail and pertinent references are given in the OCS Sale No. 48 EIS and POCS Reference Paper No. 1 (U.S. Department of the Interior 1978 a,b).

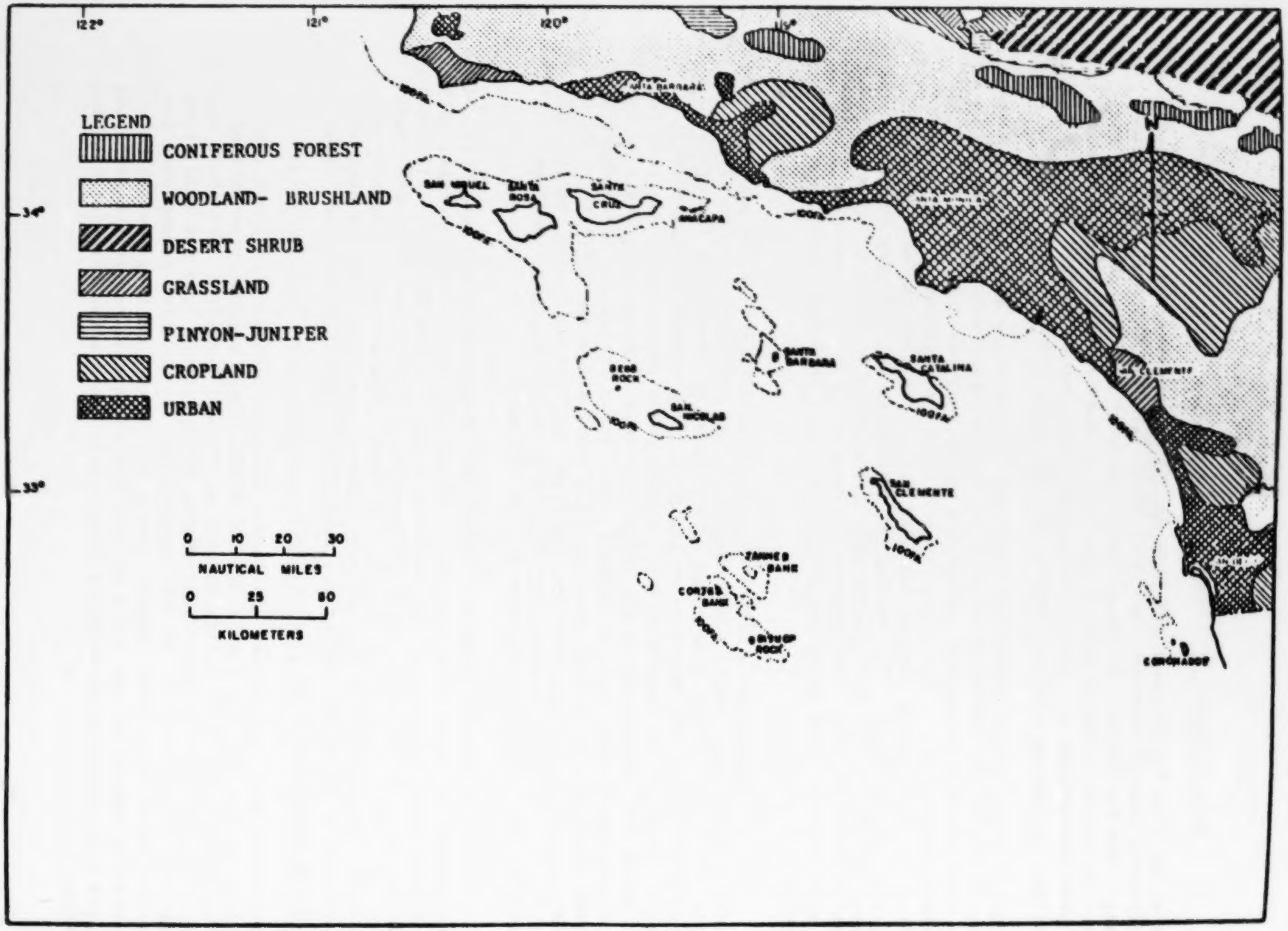
122°
121°
120°
119°
34°
33°
LEGEND
▥ CONIFEROUS FOREST
▒ WOODLAND- BRUSHLAND
▨ DESERT SHRUB
▨ GRASSLAND
▤ PINYON-JUNIPER
▧ CROPLAND
▩ URBAN
0 10 20 30
NAUTICAL MILES
0 25 50
KILOMETERS
100FM
SAN MIGUEL
SANTA ROSA
SANTA CRUZ
ANACAPA
SANTA BARBARA
SANTA MONICA
SAN CLEMENTE
BEGG ROCK
SAN NICOLAS
SANTA BARBARA
SANTA CATALINA
SAN CLEMENTE
TANNER BANK
CORTES BANK
BISHOP ROCK
CORONADOS

Figure III.B.8-1 Vegetation of Southern California Coast

Source: Bureau of Land Management, California State Office (1973).

C. Socio-Economic Environment

The study area for proposed OCS Sale No. 68 encompasses the five Southern California coastal counties including Santa Barbara, Ventura, Los Angeles, Orange, and San Diego. Although some effects of Sale No. 68 activity may occur in virtually every part of the country due to the interconnections between industries, the direct effects are expected to be felt in these five Southern California counties chosen for the study area.

Economic activity and population densities in the study area range from the heavily industrialized urban centers in the Los Angeles-Orange County area to the more sparsely populated, predominantly agricultural region in the Santa Barbara-Ventura area. The three largest counties adjacent to the proposed sale area, Los Angeles, Orange, and San Diego, are also the most populated counties in the State. The population, business, and industry which is concentrated in the greater Los Angeles area is exceeded in the U.S. only by the greater New York area. The greater Los Angeles area also possesses a large, diverse economic base which includes established petroleum production and service facilities.

1. Demography: Estimates and characteristics of the population for Southern California counties and coastal cities for January, 1980, are shown in Table III.C.1-1. These five counties represent 51 percent of the State's total population. The majority of the population resides in the coastal areas. Although the region is still considered a growth area, the rate does not match that prevailing in the 1950s and 1960s. Ventura and Santa Barbara Counties, which have recently begun to feel urban pressures, are attempting to manage their growth through program which would encourage infilling within urban areas so as to preserve the important agricultural uses. Additional descriptive information about the study area may be found in the Final Environmental Statement--OCS Sale No. 48, Volume I.

2. Coastal Economics: California is presently the nation's leading agricultural producer receiving nearly 10 percent of all cash receipts nationally from only 3 percent of the nation's farms. In the Southern California region, tourist-related business contributes to retail and wholesale trade which is a key sector in California's economy. The aerospace industry is also strong economically with the aircraft sector being traditionally dominant. California's important industries, agriculture, manufacturing, and trade, are also regionally dominant.

The coastal zone of Southern California has been divided into three coastal regions in the 1975 California Coastal Plan. These regions possess similar socio-economic characteristics as well as natural features. The three regions are: 1) the south central coast region which extends from San Luis Obispo County to Ventura County; 2) the south coast region which encompasses Los Angeles and Orange County coastal areas; and 3) the San Diego coastline. This discussion emphasizes the south central and south coast regions because the majority of the proposed offshore development would occur north of San Diego County.

TABLE III.C.1-1

SELECTED DEMOGRAPHIC STATISTICS

County & Major Coastal Cities	Estimated Population 1-1-80[a]	Population Density per Square Mile[b]
Santa Barbara	295,100	108
Carpinteria	10,100	
Lompoc	26,250	
Santa Barbara, City	73,500	
Santa Maria	37,050	
Ventura	510,300	276
Camarillo	33,450	
Oxnard	98,300	
Port Hueneme	18,500	
San Buenaventura	70,100	
Los Angeles	7,163,100	1,764
Long Beach	345,300	
Los Angeles	2,817,800	
Santa Monica	88,600	
Torrance	126,700	
Orange	1,896,200	2,425
Huntington Beach	172,200	
Newport Beach	65,300	
San Diego	1,808,200	425
San Diego, City	842,100	853
Regional Total	11,672,900	
State Total	22,911,000	146

Source: [a] State of California, Population Research Unit, May, 1980.

[b] Based on Dept. of Water Resources California Regional Framework Study.

In the south central coast region counties, a significant percent of total employment (California Employment Development Department data) is in the agricultural, fishing, and forestry sector with agriculture being the largest component. Leading crops are citrus fruits, avocadoes, and truck crops. Approximately 5 percent of the value of farm products sold in the State comes from these two counties. There is significant developmental pressure on farmlands, particularly in the Oxnard Plain of Ventura County.

In recent years, manufacturing is a rapidly growing source of income in the south central coast region. The aerospace industry is most important in terms of employment in Ventura County while in Santa Barbara County, growth in employment in electric and electronic equipment manufacture has been significant.

The economy of the south coast region is well diversified across industries. Orange County is heavily concentrated, relative to the rest of the State, in construction and durable goods manufacturing. In Los Angeles County, employment is well diversified across industries with a large portion in the service, aerospace, retail, and government sectors. Los Angeles County ranks first in California in many manufacturing categories including employment, wages, value added (48 percent of the State total in 1972), and new capital expenditures.

The Southern California area also rates high in terms of petroleum production with Los Angeles, Orange, Ventura, and Santa Barbara Counties ranking second, third, fourth, and fifth, respectively, among all of California's counties in 1979. Petroleum production occurring in State tidelands leases accounts for much of Santa Barbara County's petroleum output.

The relative importance of the manufacturing and agricultural sectors is indicated by the data presented in Table III.C.2-1. Important variables displayed are median income, value added by manufacture, new capital expenditures, and agricultural sales.

Table III.C.2-2 shows the components of employment for the counties in the study area. The proportion of employment in retail trade and services is comparable to State and national averages in all counties except in Santa Barbara which is lower for retail trade. Tourism-related employment occurs mainly in the services sector and is difficult to identify as a separate item. The employment data also indicate that agriculture is a significant component in Santa Barbara and Ventura Counties. The most recent unemployment figures indicate that unemployment in the more densely populated counties in the study area tended to be higher than in Santa Barbara and Ventura Counties.

3. Public Services and Facilities: Existing service levels for major categories of services were examined in order to determine the capacity of each in terms of the population that each can serve. Present service levels which have implications for patterns of future growth are emphasized here. As a result of this inventory and evaluation, the following basic categories were identified for further discussion: 1) water supply, 2) waste treatment and disposal, and 3) general government.

Both Santa Barbara and Ventura Counties are experiencing or expect localized stress on the capacity of water supply and waste treatment facilities.

TABLE III.C.2-1

SELECTED ECONOMIC INDICATORS FOR COUNTIES IN THE SALE NO. 68 AREA

County	Value Added by Manufacture (1972) Millions of Dollars	New Capital Expenditure (1972) Millions of Dollars	Value of Agricultural Sales[b] (1974) Millions of Dollars	Average Annual Change in Per Capita Income (1969-1974)	Median Income, 1977 Tax Year[b]
Santa Barbara	169.7	10.2	150.0	7.0%	10,607
Ventura	288.5	21.4	251.7	7.1%	12,660
Los Angeles	15,234.9	692.3	144.4	6.2%	10,747
Orange	2,734.4	144.3	1.7	7.1%	12,657
San Diego	1,185.2	53.4	204.3	7.2%	10,515
The State	31,175.2	1,645.9	7,360.5	6.9%	11,717

Source: [a]California Franchise Tax Board, Research and Statistics

[b]U.S. Bureau of the Census, 1977, County and City Data Book.

TABLE III.C.2-2

CHARACTERISTICS OF EMPLOYMENT IN THE SALE NO. 68 AREA

County	Avg. Monthly Employment All Industries-1978	Percent Employment-1978					Unemployment Rate 9-80
		Agri., Forestry, & Fishing	Manufacturing	Retail Trade	Services	Other	
Santa Barbara	118,244	6	13	3	25	53	5.5%
Ventura	142,849	11	15	19	16	39	7.4%
Los Angeles	3,308,760	1	27	16	22	34	7.5%
Orange	737,303	2	27	20	19	32	4.3%
San Diego	562,229	3	16	21	22	38	6.4%
The State	9,041,771	4	21	18	20	37	6.9%

Source: Based on data provided by the California Employment Development Department.

In Ventura County, public service capacities for sewer systems are severely limited in the north coast area (from Santa Barbara County to the Ventura River Basin) and the south coast area (from the southern city limit to Oxnard to Los Angeles County). The water supply capacity is severely limited in the south coast area as well (Ventura County General Plan). Currently, the County relies on imported water to make up for the deficits.

In 1979, Santa Barbara County voters rejected importation of State water as a means of augmenting the County's limited water resources. Currently, water deficits are being experienced in the Carpinteria, Montecito, and Goleta water districts (Santa Barbara County Coastal Plan). Section III.D.3 discusses projected capacities for these types of community services.

Due to declining school age population, public school facilities are not experiencing the pressures that were experienced only a few years ago and are not the subject of detailed examination in this document.

Public revenues used to finance the acquisition and operation of public facilities present a complex analytical situation because of the differing fiscal situation of county governments, school districts, and municipalities. When examining revenues and expenditures, it is important to note that certain legal limitations have been placed on the taxing power of political jurisdictions. Local capital expenditures which may occur as a result of OCS-related population growth are impossible to forecast. Table III.C.3-1 presents a summary of county fiscal data for 1977-78.

A description of expected future socio-economic conditions may be found in Section D of this chapter.

TABLE III.C.3-1

FINANCIAL TRANSACTIONS CONCERNING COUNTIES

Thousands of Dollars
(1977-1978)

County	Receipts All Sources	Payments	Estimated (1976-77 Current) Property Tax Revenues
Santa Barbara	104,682	105,959	28,823
Ventura	182,579	158,569	49,146
Los Angeles	3,328,110	3,213,876	1,096,377
Orange	399,699	393,854	116,432
San Diego	490,561	489,427	131,863

Source: State of California, Office of the State Controller, Division of Local Government Fiscal Affairs.

4. Coastal Land Use: Land use along the Southern California coastal zone is generally classified as urban in nature. Because of the topographic features of the region, the urban growth areas are separated by ranges of low mountains, marshes, or other physical characteristics, and are confined to geographic areas suited to intensive development. The transportation systems are situated within the region because of the geographical and physical characteristics and, therefore, reinforce the pattern of urban growth. The major Southern California coastal population centers are in the Santa Barbara, Oxnard-Ventura, Los Angeles, Long Beach, Orange County, and San Diego metropolitan areas.

Land use by category for each county's coastal zone[a] is shown in Table III.C.4-1. The reporting categories are broad but present the development form and structure of the urban and non-urban areas. The agricultural category includes all arable land under cultivation and fallow. The urban category includes all residential, industrial, commercial, and vacant areas. The military category consists of military installations. The native cover category consists of all non-developed areas with native vegetation, or water bodies. Finally, the recreation category includes parks and the actual residential or commercial use areas within a recreational area. This includes all camping and trailer sites, but does not necessarily include the parkland itself, which is usually included in the native category. Actual areas of recreational facilities within the coastal zone are found in Table III.C.5-1.

The spatial distribution of the urban uses and the major agricultural uses for Southern California is shown in Figure III.C.4-1. The major urban concentration is in the southern portion of Los Angeles County with extensions overlapping into San Bernardino, Riverside, and Orange Counties. The next largest concentration is found in the San Diego urban area which extends from the coast to eastern valleys. Other large urban groupings are found in the Oxnard, Ventura, and Santa Barbara areas.

The projection for the year 2000 is an increase by above 196,625 acres in the urban area over the 1975 figure of 882,266 acres for Ventura, Los Angeles, and Orange counties. Similar increases are expected for San Diego and Santa Barbara counties, although not to the extent of the other counties. This increase in urban use will require a reduction in the other uses, primarily agricultural. Additionally, this increase in urban areas, which will be primarily residential, will require an increase in available open space and

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[a] "Coastal zone" means that land and water area of the State of California extending seaward to the State's outer limit of jurisdiction, including all offshore islands, and extending inland generally 1,000 yards from the mean high tide line of the sea. In significant coastal estuarine, habitat, and recreational areas it extends inland to the first major ridgeline paralleling the sea or 5 miles from the mean high tide line of the sea, whichever is less, and in developed urban areas the zone generally extends inland less than 1,000 yards.

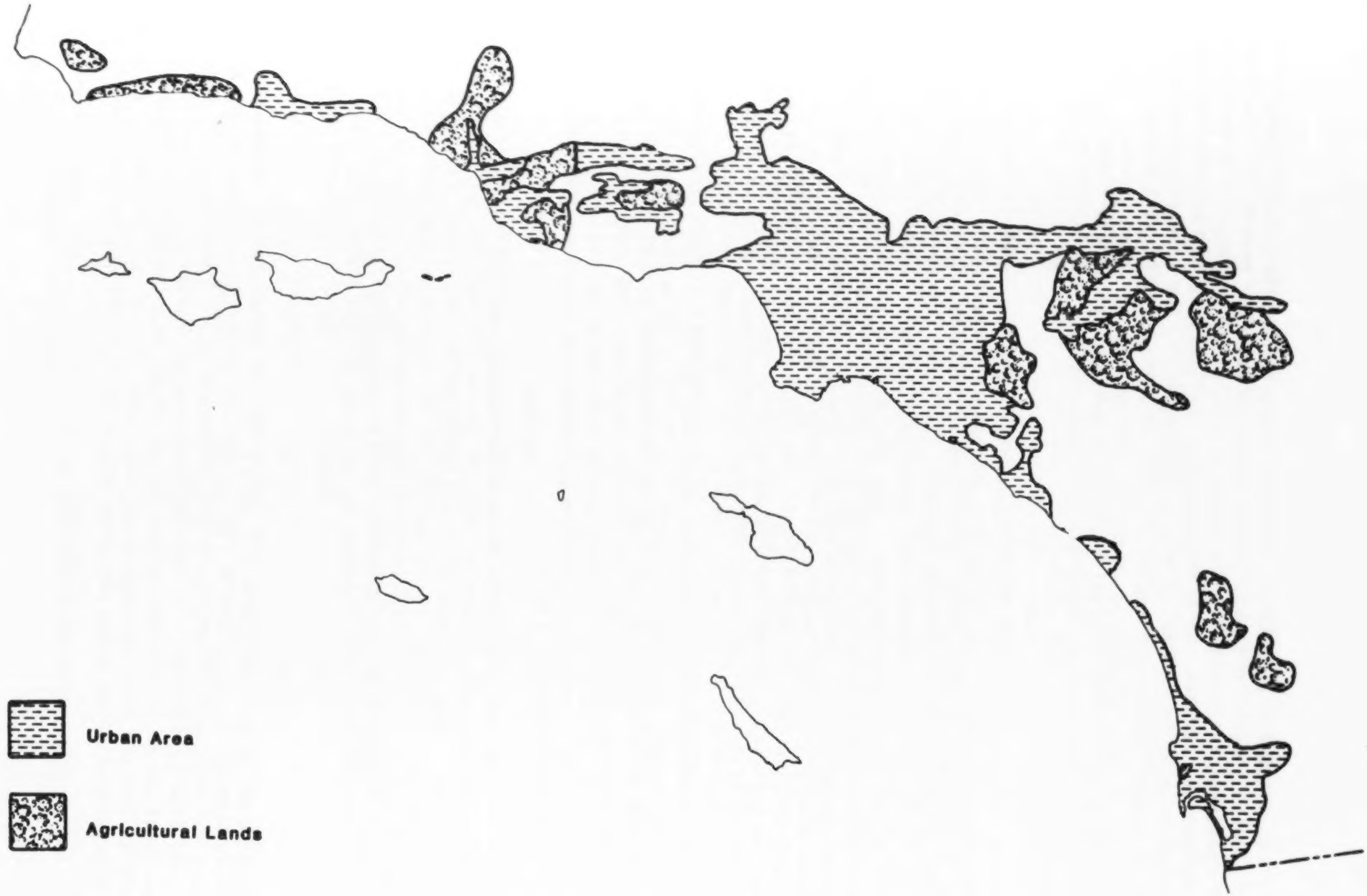
Urban Area
Agricultural Lands

Figure III.C.4-1 General Land Use Distribution

TABLE III.C.4-1

COASTAL ZONE LAND USE IN ACRES

	Santa Barbara	Ventura	Los Angeles	Orange	San Diego	Total	% of Total
Agriculture	6,811	2,432	700	834	8,091	18,868	5.7%
Urban	4,831	3,095	21,939	11,662	27,958	69,485	21.1%
Military	0	3,968	713	3,559	13,755	21,995	6.7%
Native Cover	57,558	24,845	70,853	23,372	35,072	211,700	64.4%
Recreational	175	206	3,105	450	2,856	6,792	2.1%
Total	69,375	34,546	97,310	39,877	87,732	328,840	

recreational areas, as the growing population will tend to overcrowd existing areas. The overcrowding of these areas will induce an increase in access ways to the shoreline, through areas of privately owned land. Also, these will be an increase in utilization of inland recreational areas, such as the Santa Monica Mountains. People will still tend to congregate in habitually used recreational areas. As transportation costs are increasing, open areas will need to be incorporated into all developing areas. In addition to reducing transportation costs, integrating the open space areas will also have psychological advantages.

Shoreline Use and Ownership. The State of California owns the submerged land off the coast and around each of the Channel Islands for a distance of 3 geographical miles seaward from the high tide line. The area of ownership follows the coastline and the shoreline properties are a mixture of private and publicly owned parcels.

A description of the regional coastal land uses from Point Reyes to the U.S.-Mexican Border, with emphasis upon the area south of Point Conception where the majority of the proposed actions would occur, may be found in Sale No. 48 POCS Reference Paper No. II.

5. Recreation: Recreation is an important component of the Southern California environment and economy. An abundance of opportunity combined with a large, highly mobile population creates a situation unparalleled elsewhere in the world. The Southern California coast is a highly sensitive natural resource area and is an important recreational asset to the residents of the State and to tourists. It is an extremely diverse area in respect to the landscape in that it varies from rugged, wind-blown cliffs to flat sandy beaches with stable dune backshores. This diversity creates a unique area which changes character at every bend of the shoreline and embayment, attracting tourists from all parts of the world to view the scenery and enjoy the spectacular natural environment. Or, if they desire, they can be in a densely populated commercialized recreation area within a relatively short distance. Along the coast, recreation is primarily water-oriented, both from an active participation, and from an aesthetic and passive aspect. There are numerous public and privately owned recreational sites which have direct access to the ocean.

The coastal State Parks are shown on Figure III.C.5-1 to help exemplify the density of the recreational areas in Southern California. These areas have a total shoreline of over 277 km (172 miles) which is more than 50 percent of the 544 km (338 miles) ocean shoreline of the Southern coast. This, in turn, permits visitors access to the ocean with relative ease in order to pursue whatever activity they desire. Visitation of these beach areas has more than doubled over the least 10 years as shown in Figure III.C.5-2 and Table III.C.5-1.

The major recreational activities of the area are sightseeing, beachcombing, picnicking, boating, swimming, wading, sunbathing, diving, surfing, and sportfishing. Sightseeing and beachcombing are enjoyed along the entire coast and are mainly dependent on the esthetic aspect of the area (see visual resources).

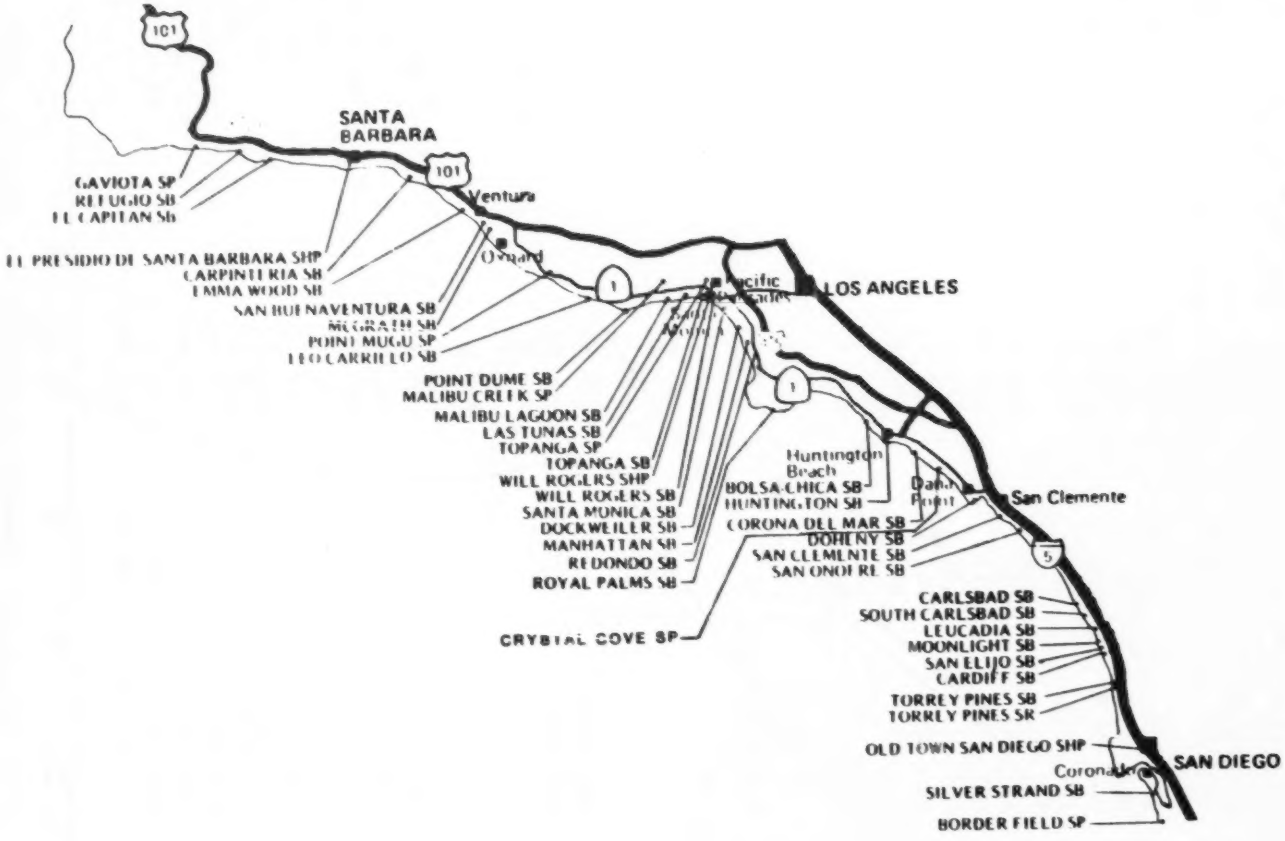
101
SANTA BARBARA
101
Ventura
Oxnard
1
Pacific Palisades
Santa Monica
LOS ANGELES
1
Huntington Beach
Dana Point
San Clemente
5
SAN DIEGO
Coronado
GAVIOTA SP
REFUGIO SB
EL CAPITAN SB
EL PRESIDIO DE SANTA BARBARA SHP
CARPINTERIA SB
EMMA WOOD SB
SAN BUENAVENTURA SB
McGRATH SB
POINT MUGU SP
LEO CARRILLO SB
POINT DUME SB
MALIBU CREEK SP
MALIBU LAGOON SB
LAS TUNAS SB
TOPANGA SP
TOPANGA SB
WILL ROGERS SHP
WILL ROGERS SB
SANTA MONICA SB
DOCKWEILER SB
MANHATTAN SB
REDONDO SB
ROYAL PALMS SB
CRYSTAL COVE SP
BOLSA CHICA SB
HUNTINGTON SB
CORONA DEL MAR SB
DOHENY SB
SAN CLEMENTE SB
SAN ONOFRE SB
CARLSBAD SB
SOUTH CARLSBAD SB
LEUCADIA SB
MOONLIGHT SB
SAN ELIJO SB
CARDIFF SB
TORREY PINES SB
TORREY PINES SR
OLD TOWN SAN DIEGO SHP
SILVER STRAND SB
BORDER FIELD SP

Figure III.C.5-1 Coastal State Park and Beaches in Southern California

Source: State of California Department of Parks and Recreation.

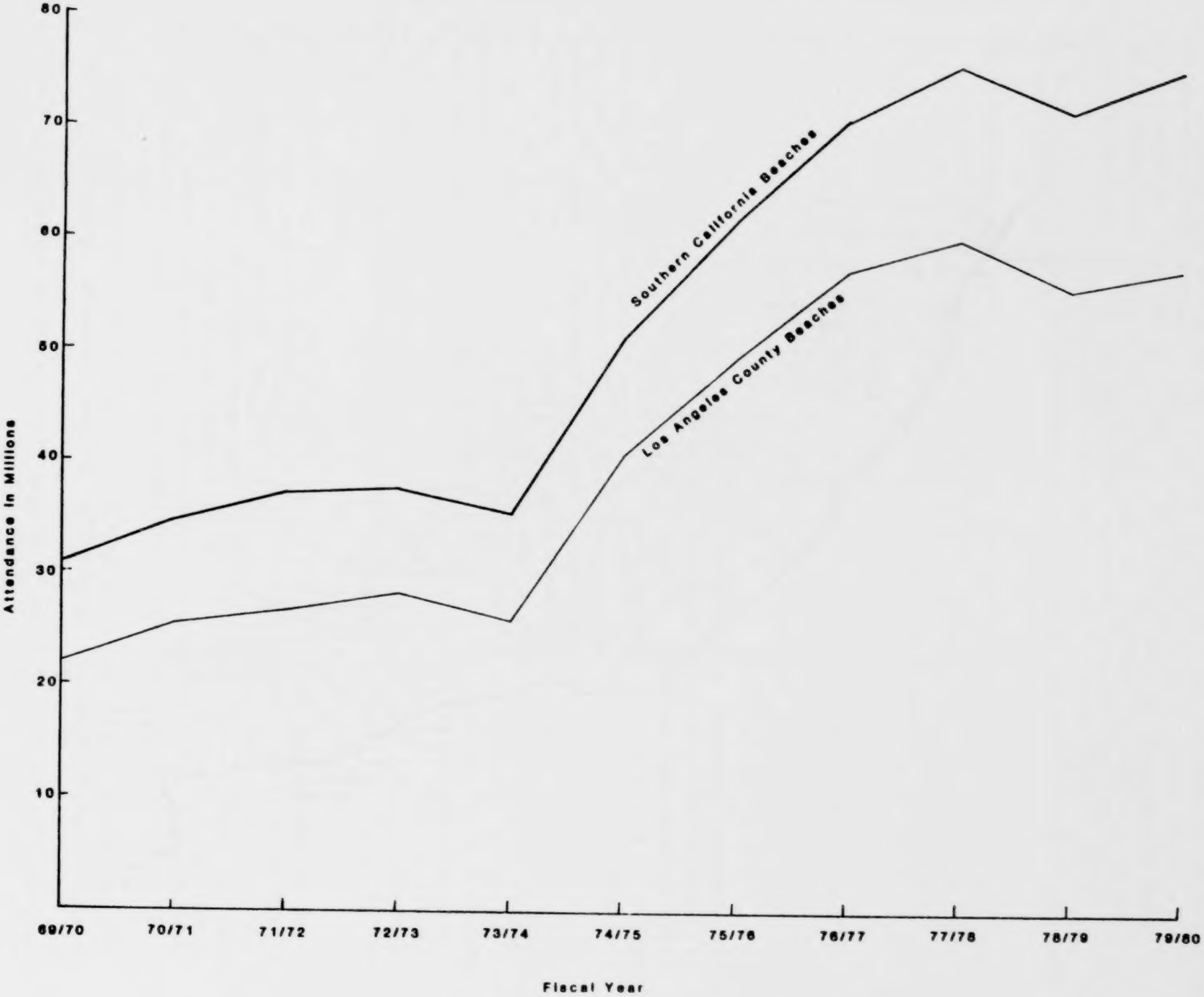

Figure III.C.5-2 Southern California Beach Use

TABLE III.C.5-1

STATE RECREATION AREAS

Facility	Ocean Frontage	Area	Attendance 1979/80	Attendance 1978/79
Gaviota SP	27,500	2,775	180,652	192,206
Refugio SB	14,100	90	180,048	200,176
El Capitan SB	9,620	133	327,141	296,274
Carpinteria SB	4,115	50	373,651	387,705
Rincon Pt	-	3	20,378	20,215
Emma Wood SB	14,440	116	141,588	97,934
San Buenaventura SB	11,630	116	970,209	969,798
McGrath SB	10,445	295	168,368	141,316
Point Mugu SP	19,224	13,369	601,603	577,286
Leo Carrillo SB	6,597	1,578	626,751	528,788
Point Dume SB	4,449	31	57,533,818	55,769,888
Malibu Lagoon SB	2,950	3,798		
Las Tunas SB	1,560	2		
Topanga SB	5,800	31		
Will Rogers SB	9,715	66		
Santa Monica SB	10,073	47		
Dockweiller SB	11,346	91		
Manhattan SB	10,950	44		
Royal Palms SB	4,678	18		
Alamitos Beach	-	-		
Bolsa Chica SB	27,607	164	2,765,989	1,883,151
Huntington SB	10,900	78	3,002,313	2,642,190
Corona Del Mar SB	2,439	30	-	-
Crystal Cove SP	Under develop.	-	-	-
Doheny SB	6,567	62	594,296	643,399
San Clemente SB	6,000	110	633,465	542,026
San Onofre SB	24,880	3,036	722,701	445,002
Carlsbad SB	5,429	14	1,193,877	1,066,886
S. Carlsbad SB	12,159	122	795,238	764,229
Leucadia SB	5,380	11	425,496	381,934
Moonlight SB	1,820	14	1,103,877	848,813
San Elijo SB	9,130	39	452,190	535,992
Cardiff SB	3,819	11	1,025,566	801,988
Torrey Pines SB and SR	23,613	1,040	946,379	1,283,072
Silver Strand SP	23,500	428	395,607	416,012
Border Field SP	6,040	680	114,916	147,716
	348,275	28,492	75,296,117	71,583,996

Source: Dept. of Parks and Recreation State of California
L.A. County Dept. of Beaches

READEX FICHE best copy available

Picnicking is mainly family group oriented and tends to be concentrated at easily accessible recreational facilities. Boating is not limited to any specific area along the coast, although concentrations can be found in areas such as San Diego, Los Angeles, Ventura, and Santa Barbara.

Boating registration and participation days can be found in Table III.C.5-2, and major marinas are shown on Figure III.C.5-3, and docking space and marina facilities on Table III.C.5-3.

Swimming, wading, and sunbathing are primarily summer activities and will occur mainly on sandy coast type beaches (see Table III.C.5-4 for distribution). Diving occurs along the entire coast and is growing more popular each year. This is evidenced by the fact that on an annual basis new and advanced certification of SCUBA divers has grown from approximately 116,000 in 1970 to over 280,000 in 1977. There are presently 8 underwater parks and 16 other subtidal areas proposed or under consideration by the State for inclusion in the California State Park system (see Figure III.C.5-4). These draw heavy use from the diving community.

One of the major destinations for divers and boaters are the offshore islands. Santa Catalina Island is the most visited, as it has regular ferry and air service from the Los Angeles area and it is the closest to the Los Angeles Metropolitan area. Landing is relatively unrestricted with major anchorages at Avalon and Two Harbors. Permits are required for travel in the interior to help protect sensitive vegetation. Diving occurs primarily along the north shore at Bird Rock and Ship Rock area, and off the west shore at Farnsworth Bank. Boating occurs around the entire island. The Channel Islands National Park was officially dedicated on March 5, 1980, and consists of San Miguel, Santa Rosa, Santa Cruz, Santa Barbara, and Anacapa Islands. Visitation will continue to be restricted, but boating and diving will continue to be popular activities in the surrounding waters. San Nicolas and San Clemente Islands are under the jurisdiction of the U.S. Navy, and landing is by permit only. Diving and boating occur in the surrounding waters, but there is not the heavy use that is found around the other islands due to the distance from the mainland.

Surfing depends entirely on the climatic and oceanic conditions that are present at each of the suitable surfbreaks. There has been a large increase in surfing over the past years due to the use of wet suits to protect the surfers from the cold. This allows the sport to be practiced over the entire year rather than just during the warmer season.

Tourism. Tourism is one of the largest industries in Southern California and supports approximately a million jobs according to the Southern California Visitors Council. In 1978, visitors spent more than $7.2 billion in Southern California. In addition to out-of-state tourists, Southern California attracts a considerable number of visitors from the rest of California. Tourist expenditure is important in that it adds to economic wellbeing by contributing directly and indirectly to almost every sector of regional economic activity (see Technical Paper No. 81-1 for economic details).

TABLE III.C.5-2

BOAT REGISTRATION AND PARTICIPATION DAYS

	1976	1979	Through 1/30 1980	1979 Participation Days
Santa Barbara	7,161	7,312	6,807	874,252
Ventura	11,608	12,629	12,188	1,509,974
Los Angeles	107,322	104,737	97,371	12,522,775
Orange	44,789	49,025	46,279	5,861,625
San Diego	31,449	34,535	32,919	4,129,143
Total	202,329	208,238	195,564	24,897,769

Participation Days Based on 28.4 Days Boat Use and 4.21 People/Boat.

Source: Department of Motor Vehicles Vessel Registration

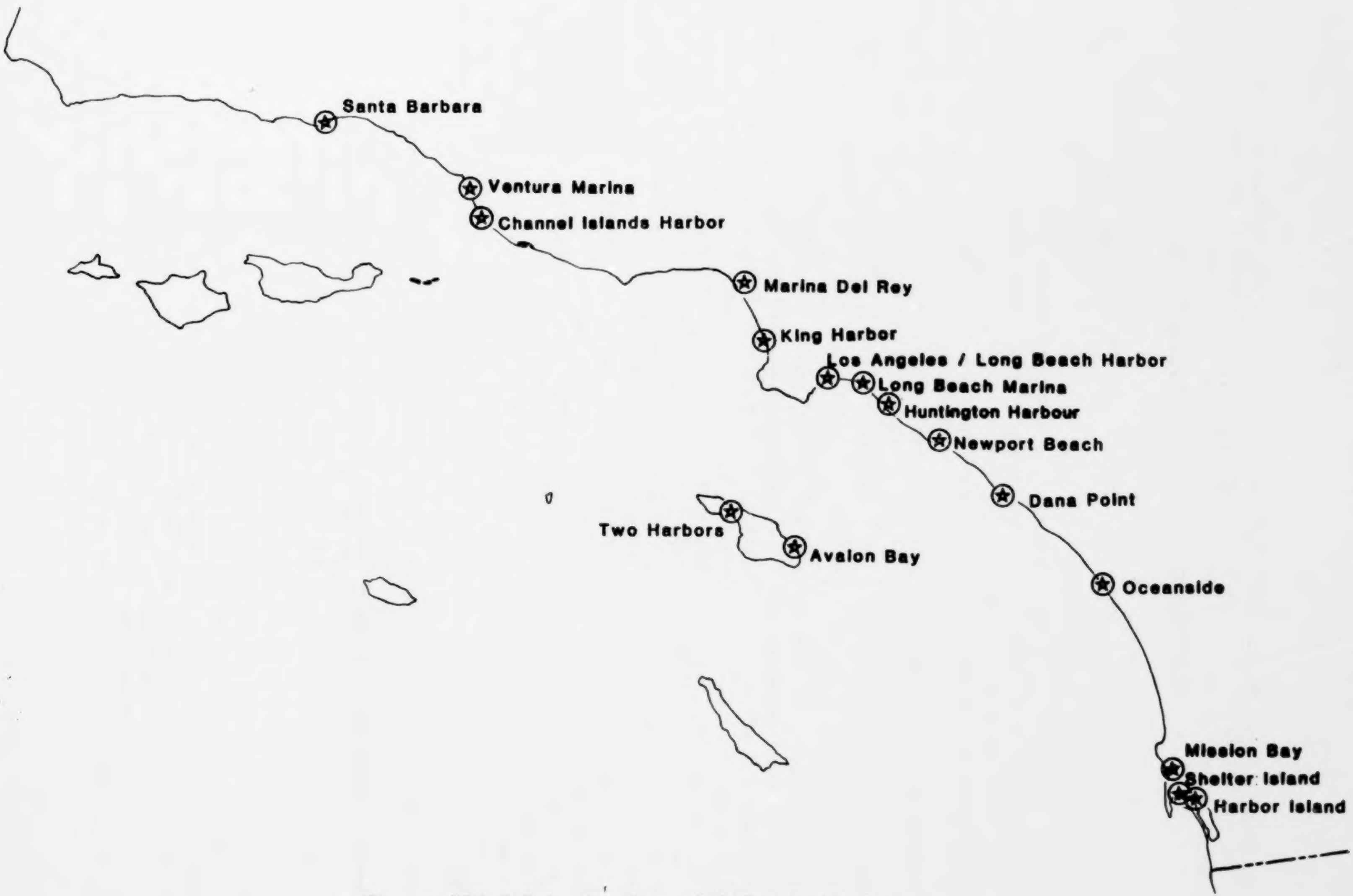
Santa Barbara
Ventura Marina
Channel Islands Harbor
Marina Del Rey
King Harbor
Los Angeles / Long Beach Harbor
Long Beach Marina
Huntington Harbour
Newport Beach
Dana Point
Oceanside
Two Harbors
Avalon Bay
Mission Bay
Shelter Island
Harbor Island

Figure III.C.5-3 Southern California Marinas

TABLE III.C.5-3

SOUTHERN CALIFORNIA MARINAS

Marina	No. Slips
Santa Barbara	1,000
Ventura Marina	500
Channel Islands Harbor	1,600
Marina del Rey	6,000
King Harbor	1,600
Los Angeles/Long Beach Harbor	3,000
Long Beach Marina	2,000
Huntington Harbour	2,300
Newport Harbor	6,500+
Dana Point	2,600
Oceanside	800
Mission Bay	1,900
Shelter Island	2,000
Harbor Island	1,000
Glorietta Bay	215

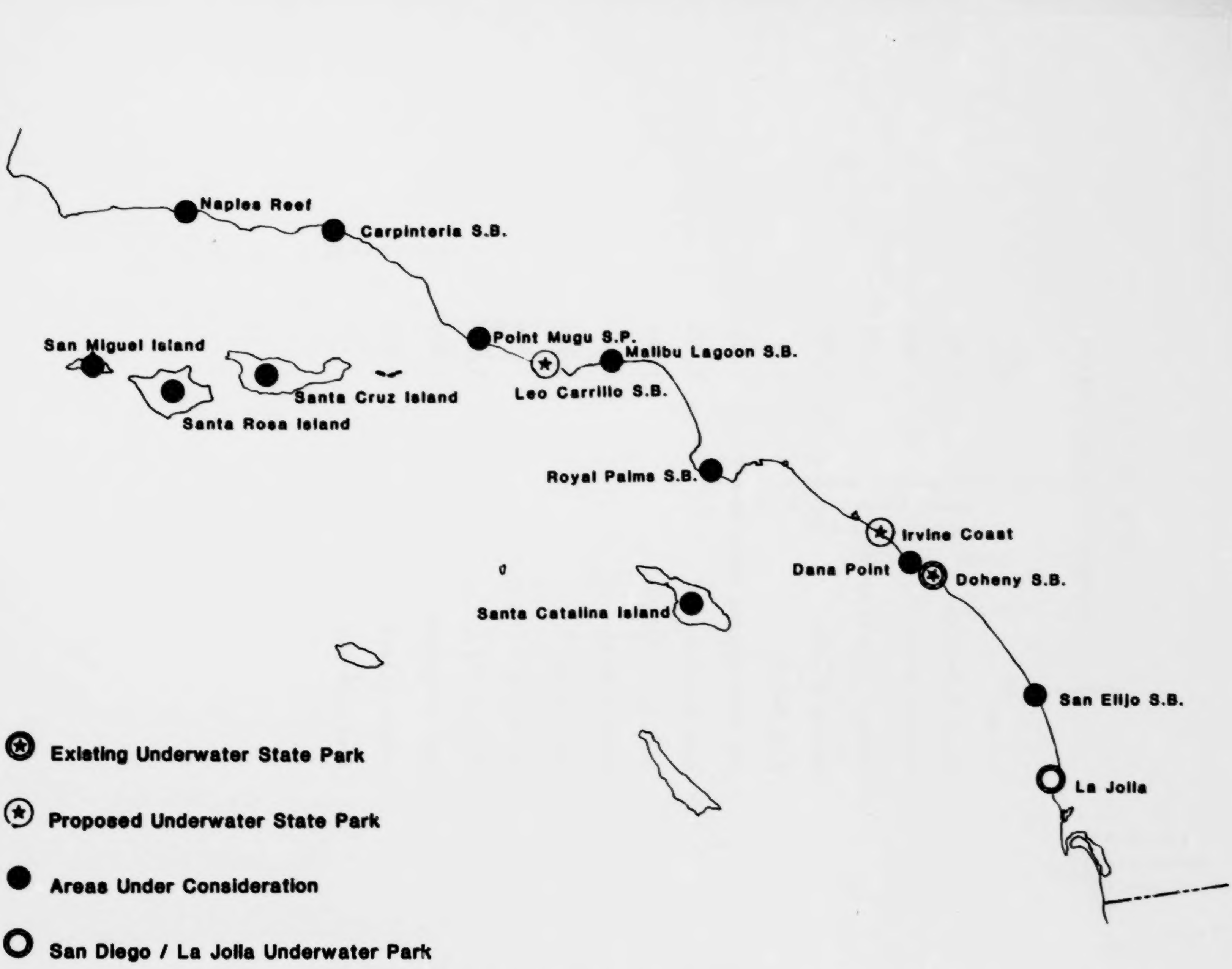
Naples Reef
Carpinteria S.B.
Point Mugu S.P.
Malibu Lagoon S.B.
Leo Carrillo S.B.
San Miguel Island
Santa Cruz Island
Santa Rosa Island
Royal Palms S.B.
Irvine Coast
Dana Point
Doheny S.B.
Santa Catalina Island
San Elijo S.B.
La Jolla
Existing Underwater State Park
Proposed Underwater State Park
Areas Under Consideration
San Diego / La Jolla Underwater Park

Figure III.C.5-4 Southern California Underwater Parks

TABLE III.C.5-4

COAST TYPE BY OWNERSHIP (IN KILOMETERS)

	Sandy Coast						Rocky Coast						
County													
Santa Barbara	22.3	12.6	7.7	6.6	85.1	134.3	15.6	3.9	0.5	0	20.9	40.9	175.2
Ventura	7.7	18.8	14.0	3.7	17.1	61.3	0	2.9	0	0	3.5	6.4	67.7
Los Angeles	0	28.8	4.7	0	48.1	81.6	3.9	2.6	3.5	0	20.3	30.3	111.9
Orange	0.3	15.8	1.9	14.3	22.5	54.8	0	0	1.3	0.6	9.7	11.6	66.4
San Diego	37.4	26.9	0.3	1.0	38.6	104.2	7.9	0	0	0.5	9.8	18.2	122.4
Total	67.7	102.9	28.6	25.6	211.4	436.2	27.4	9.4	5.3	1.1	64.2	107.4	543.6

Channel Islands Not Included

Source: California Coastline Preservation and Recreation Plan August 1971

1 KM - 0.621 Miles

The attractions which Southern California has to offer the tourist are many and varied. Those who like outdoor recreation have the mountains, desert, and excellent beaches to choose from, while others may be attracted to the cultural activities found in the larger cities. As important, however, are a number of commercial attractions, (Figure III.C.5-5) most famous of which is Disneyland. Others include Knotts Berry Farm, Marineland, Lion Country Safari, and Magic Mountain, all located in the Los Angeles-Orange County area, and Sea World located in San Diego. There are outstanding zoos in Los Angeles and San Diego.

These attractions have an annual attendance of over 46.6 million (Table III.C.5-5) which means an expenditure of over $220 million in 1979 by tourists for admission to the attractions and rides. This is only a minor part of tourist expenditure, but shows the magnitude of tourist spending in Southern California when combined with other services such as motels and restaurants.

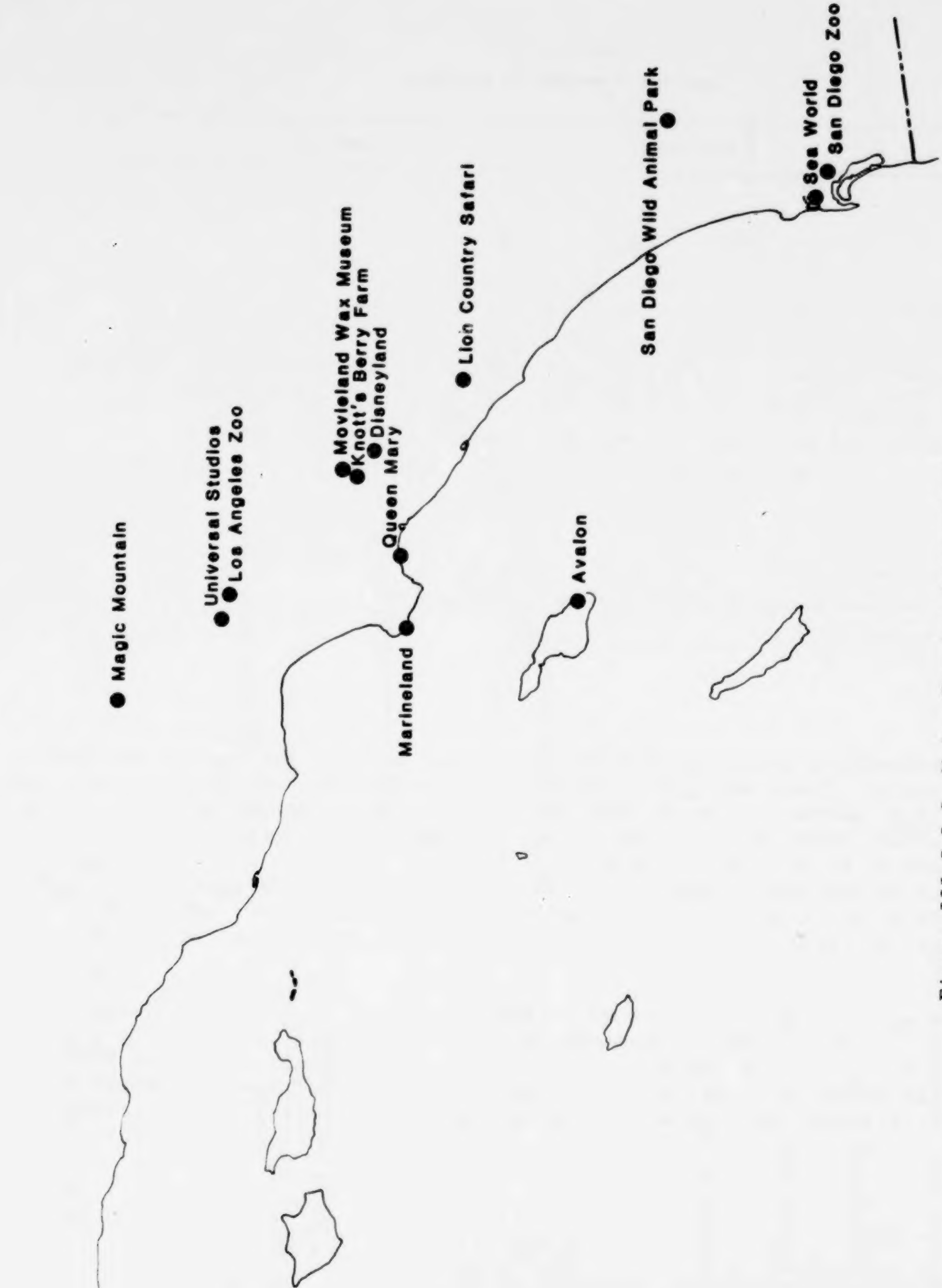
Magic Mountain
Universal Studios
Los Angeles Zoo
Marineland
Queen Mary
Movieland Wax Museum
Knott's Berry Farm
Disneyland
Lion Country Safari
Avalon
San Diego Wild Animal Park
Sea World
San Diego Zoo

Figure III.C.5-5 Major Tourist Attractions

TABLE III.C.5-5

MAJOR SOUTHERN CALIFORNIA TOURIST ATTRACTION ATTENDANCE

(To Nearest Thousand)

Attraction	1979 Attendance
Disneyland	10,700,000
Sea World	2,454,000
San Diego Zoo	3,038,000
Univ. Studios Tour	3,500,000
Queen Mary	516,000
Knotts Berry Farm	4,000,000
Magic Mountain	2,000,000
Marineland	1,030,000
San Diego Wild Animal Farm	1,034,000
Burbank Studio Tour	5,000
Movieland Wax Museum	1,000,000
Fleet Space Center	534,000
Museum of Science & Industry	1,500,000
Los Angeles Zoo	1,531,000
Lion Country Safari	48,000
NBC Studios Tour	210,000
California Alligator Farm	50,000

Source: PSA June 1980
California Alligator Farm 1980 Personal Communication
Burbank Studio Tour 1980 Personal Communication
Marineland 1980 Personal Communication

6. Oil and Gas Infrastructure: The refinery capacity in California, as reported in the March 24, 1980, Oil and Gas Journal, is tabulated in Table III.C.6-1. This report indicates a total of 41 refineries in California with a total refining capacity of 2,506,370 barrels per calendar day (bcd). In the Los Angeles Basin, there are 19 refineries with a total capacity of 1,307,320 bcd which represents approximately 52 percent of total California capacity.

According to the Department of Energy Report (Energy Data Report, Petroleum Statement March 1980) for the month of March, the California refineries received 50,615,000 barrels of domestic crude oil and 10,612,000 barrels of foreign crude. Of the domestic crude, 26,203,000 barrels were intrastate and 24,412,000 barrels, interstate. The foreign receipt in California represents about 8 percent of total foreign import to the United States.

7. Transportation Systems

a. Ports and Shipping: The Eleventh Coast Guard District is conducting a Port Access Route (PAR) Study (The Port and Tanker Safety Act of 1978 amends the Port and Waterways Safety Act of 1972) for those areas included in OCS Lease Sale No. 68. The Coast Guard is considering a PAR routing proposal consisting of the following: 1) existing Port Hueneme Shipping Safety Fareway (SSF), 2) existing Point Conception to Point Fermin Traffic Separation Scheme (TSS), 3) existing Gulf of Santa Catalina TSS, 4) recommended westerly extension of Point Conception to Port Fermin TSS, and 5) recommended addition of 500 meter buffer zone on both sides of the TSS traffic lane. This PAR study is expected to be completed in the first part of 1981 (Terveen 1980). For an illustration of the proposed PAR, see Transportation Visual.

Total freight traffic for the main ports between Point Conception and the Mexican Border is tabulated in Table III.C.7.a-1 and illustrated in the Transportation Visual.

Fourteen conventional types of petroleum marine terminals (five to seven buoys) are located inside State waters along the coast of Southern California. These marine terminals have submarine pipelines from the terminals to onshore facilities to load and unload tankers with crude oil and unload tankers with fuel oil.

Reese-Chambers Systems Consultants, in March 1980, did a commercial merchant vessel analysis through the Santa Barbara Channel via Point Conception to Point Fermin Traffic Separation Scheme (TSS). They projected the number of vessels from the Los Angeles-Long Beach ports and Port Heuneme passing through the TSS on a daily basis as follows: 1980, from 12.4 to 15.7 ships per day; 1990, 13.9 to 19.3; and 2000, 14.7 to 21.7. They also indicated that the percentage of ships using the TSS compared to the alternate route through the Channel Islands had increased from 77 percent (TSS) in 1976 to 93 percent (TSS) in 1979.

b. Pipeline Systems: Crude oil from local wells, Los Angeles and Long Beach ports, Santa Barbara Channel area (Shell and Union), and Bakersfield area (Arco and Mobil) is transported to Los Angeles Basin refineries by

TABLE III.C.6-1

REFINERIES IN CALIFORNIA

Company and Location	Capacity Barrels Per Calendar Day	
Southern California		
Los Angeles Basin (19 Refineries)		
Atlantic Richfield Co.-Carson	180,000	
Champlin Petroleum Co.-Wilmington	30,400	
Chevron U.S.A., Inc. El Segundo	405,000	
DeMenno-Kerdoon-Compton	15,000	
Douglas Oil Co.-Paramount	46,500	
Eco Petroleum Inc.-Signal Hill	5,600	
Edgington Oil Co., Long Beach	40,000	
Fletcher Oil & Refining Co.-Carson	30,500	
Golden Eagle Refining Co.-Carson	16,500	
Gulf Oil Co.-Santa Fe Springs	51,500	
Huntway Refining Co.-Wilmington	5,500	
Lunday-Thagard Oil Co.-South Gate	10,000	
Macmillan Ring-Free Oil Co.-Signal Hill	12,200	
Marlex Oil & Refining Inc.-Long Beach	NR	
Mobil Oil Corp.-Torrance	123,500	
Powerine Oil Co.-Santa Fe Springs	44,120	
Shell Oil Co.-Wilmington	108,000	
Texaco Inc. -Wilmington	75,000	
Union Oil Co. of California-Los Angeles	108,000	
Total Los Angeles Basin		1,307,320
Other Areas (4 Refineries)		
Douglas Oil Co.-Santa Maria	9,500	
Newhall Refining Co-Newhall	17,600	
Oxnard Refinery-Oxnard	2,500	
USA Petrochem Corp.-Ventura	28,500	
Total Other Areas		58,100
San Francisco Bay Area and San Joaquin Valley (18 Refineries)		
Total		1,140,950
Total California (41 Refineries)		2,506,370

Oil and Gas Journal, March 24, 1980, Annual Refining Survey

TABLE III.C.7.a-1

TOTAL FREIGHT TRAFFIC POINT CONCEPTION TO CALIFORNIA-OREGON BORDER CALENDAR YEAR 1978

Harbors	Total Waterborne[a] Tonnage (Short Ton = 2,000 Pounds)	Vessel[b] Arrivals
Long Beach	31,586,404	14,227 (11,879)[c]
Los Angeles	32,827,478	16,196 (14,185)[d]
San Diego	2,571,402	1,831 (1,592)[c]
Port Hueneme	958,668	582 (517)[c]
Total	67,943,952	32,836 (28,173)[c,d]

Source: Department of the Army Corps of Engineer, 1978. Waterborne Commerce of the United States, Part 4.

[a] Includes military shipping.

[b] Excludes domestic fishing craft, military ships, pleasure boats and through traffic.

[c] Vessels with draft of 18 feet and less.

[d] Vessels with draft of 22 feet and less.

pipelines. Hallanger Engineer Consultant did a pipeline study for Santa Barbara County as coordinator of the Industry/Government Pipeline Working Group. Hallanger concluded that the proposed pipeline to transport crude from Las Flores Canyon to Los Angeles Basin refineries is feasible.

Elk Hills crude is transported by pipelines to refineries in the following areas: San Francisco Bay, Bakersfield, Los Angeles Basin, New Mexico, and Gulf Coast. Four Corner Pipeline, a common carrier, transports crude from Los Angeles to the Four Corners Area (this is the common border area between Colorado, Utah, New Mexico, and Arizona). Crude for Four Corners is from Elk Hills, Alaskan, and local sources. Elk Hills represents most of the crude (R. French, Four Corners Pipeline, personal communication 1980.

The majority of natural gas for the Southern California coastal counties is transported in pipelines from Texas by El Paso Natural Gas Company and Transwestern Pipeline Company. At the California-Arizona State Border, the pipeline ownership is transferred from the above two gas pipeline companies to the Southern California Gas Company (SCG) and Pacific Lighting Company (PLC). San Diego Gas and Electric Company obtains gas from SCG near Fallbrook and San Diego City and supplies most of the western section of San Diego County (E. Nelson, SCG, personal communication 1980).

Crude oil and natural gas from onshore and offshore production wells in the Southern California coastal areas are processed locally, when required, in crude oil and natural gas treatment and separation facilities. Crude oil facilities separate water from crude oil before transporting the processed crude to the refineries; gas treating facilities remove liquid hydrocarbon, carbon dioxide, and hydrogen sulfides from the produced natural gas. Processed gas is sold to a gas pipeline company. In this area, there are a total of 42 separation facilities of which 23 are crude oil, 10 are gas, and 9 are oil/gas.

In Southern California there are seven man-made islands and nine fixed platforms in State waters. Federal waters contain no drilling islands, but eleven fixed platforms. Five more fixed platforms are proposed.

c. Other: In the proposed area, there are 23 municipal wastewater treatment plants that discharge effluent into the ocean. Four of the largest plants are: Los Angeles County Sanitation District Joint Water Pollution Control Plant (which discharges 350 million gallons per day [md]), City of Los Angeles Hyperion Plant (discharging 360 mgd), Orange County Sanitation Plant No. 2 (discharging 150 mgd), and City of San Diego Point Loma Plant (discharging 132 mgd).

There are six public airports shown in the Transportation Visual. These airports are located near the proposed tract areas and have helicopter landing facilities. During exploration, development, and production of offshore oil and gas resources, helicopters could be used from these airports to transport passengers and equipments to the drilling vessels, pipe lay barges, and platforms. The airports are: Oxnard, Santa Barbara Municipal, Los Angeles International, Long Beach Municipal, John Wayne (Orange County), and Lindberg Field.

The Pacific Telephone and Telegraph Company has two submarine communication cables from the breakwater at San Pedro to Avalon on Santa Catalina Island. These cables were installed in June, 1925, and are approximately 26 miles long (Transportation Visual).

The main coastal highways between Point Conception and the Mexican Border are Interstate 5, U.S. 1, and State 1. Interstate 5 starts at the Mexican Border and follows the coastline to Dana Point and turns inland through Santa Ana and Newhall. State 1 follows the coastline from Dana Point to east of Point Conception. U.S. 1 is the main highway connecting downtown Los Angeles with the coastal cities along the Santa Barbara Channel. Interstates 80 and 10 are the main highways traveling eastward from San Diego and Los Angeles, respectively. Today, although the freeway system is not yet completed, Los Angeles is served by over 20 freeways. Eight freeways diverge from the downtown freeway loop. Other freeways provide outlying by-pass, feeder, and suburb-to-suburb connection.

Three major railroad companies own and maintain six main railroad lines. Southern Pacific operates the three major railroads which run from Los Angeles (LA) through Santa Barbara, LA through Bakersfield, and LA through El Paso. Santa Fe operates the railroads from LA to San Diego and LA through San Bernardino. Union Pacific operates the railroads from LA through Las Vegas. These three companies operate all railroad freights, limited mail, and express services.

Three major electrical companies and other smaller companies supply the needed electrical power. The three major companies are Southern California Edison, Los Angeles Department of Water and Power, and San Diego Gas and Electric. Small companies include four local city power plants in Los Angeles County. Each major electrical company not only owns power plants but also purchases power from outside sources as far away as the Pacific Northwest utility companies. At El Segundo, near the Chevron Refinery, Los Angeles City Department of Water and Power operates the Scattergood steam power plant and Southern California Edison (SCE) owns the El Segundo steam power plant. SCE operates the Mandalay steam power plant and has joint ownership with San Diego Gas and Electric for the San Onofre nuclear plant.

8. Military Uses: The Department of Defense (DOD) conducts naval operations throughout the Southern California Bight. Detailed operating areas are listed in the COMMANDER THIRD FLEET OPAREA MANUAL (COMTHIRDFLT INST 3120.1J) and were shown on the Visual No. 3 published as a part of the Environmental Impact Statement for OCS Sale No. 48.

During the discussions relating to OCS Sale Nos. 35 and 48, the DOD indicated they could jointly use several areas including: the Santa Barbara Channel, near shore areas between San Pedro and Carlsbad, a small area south of the juncture of the Santa Rosa and Santa Cruz Islands, and an area southwest of the Tanner/Cortes banks. Subsequently, DOD has indicated that they do not wish to relinquish control over any more areas and are re-evaluating the Long Beach area. This has resulted in the following recommendations: 1) Delete tracts 164, 167, and 169, due to oil and gas OCS activity interference with operation of the Long Beach Naval Shipyard Electronic System Evaluation Facility (SESEF); 2) Delete tracts 56, 59, 105-107, 112-114, 118-121, 125-127, 133-135, 142-144, 195-197, due to oil and gas OCS activity interference with the operation of the Pacific Missile Range; 3) Delete tracts 189-194, 203, 204, 206, 207, 209, 210-221, due to oil and gas OCS activity interference with the operation of the San Clemente Island operating area which is involved with testing, fleet operations, training, and other activities required to maintain fleet operational readiness. The other tracts remaining in the Sale show possible conflict also with military operations including the Air Force's and NASA's missions at the Western Test Range offshore Vandenberg AFB. However, inclusion of the two stipulations previously used for the other OCS Sales will mitigate this overlap.

9. Cultural Resources: Cultural resources are prehistoric and historic remains that provide information for the reconstruction of man's past cultural systems and behaviors. In addition, this section addresses religious and other cultural elements of concerned ethnic minorities.

Cultural resources comprise a non-renewable resource base, i.e., once gone, they cannot be replaced. Cultural resource management by individuals, institutions, and governmental agencies involves the identification of these resources, their protection, and preservation for maximum longevity (Lipe 1977).

The preparation of the sections dealing with cultural resources has taken place over the past several years and has involved a variety of research methods. The initial research was performed under BLM contact and resulted in the publication of the following documents: Archaeological Literature Survey and Sensitivity Zone Mapping of the Southern California Bight Area, Volumes I and II (SAI 1978). A recent update of the shipwreck data portion of this study has also been conducted under BLM contract (Pierson 1980). A current research project under BLM contract, the Santa Barbara Channel Prehistoric Mapping Study (Hunter and Forbes, in preparation), is expected to provide detailed analysis of the archaeological potential of the study region. Current archaeological records have been obtained from the local archaeological clearinghouses. Additional research, ethnological fieldwork, and consultation has been performed in-house. Consultation has, in part, included the California State Office of Historic Preservation (personal communication 1979, 1980, 1981), the California State Native American Heritage Commission (personal communication 1979, 1980), and members of the Native American community (personal communication 1980, 1981). The *Federal Register* has been consulted regularly throughout the environmental assessment process to identify properties nominated to or on the National Register of Historic Places. The most recent issue consulted is that of February 3, 1981.

Early Man in California. The initial migration of early people from the Old World across the Bering Land Bridge occurred 100,000-25,000 B.P. (before present). MacNeish (1976) has estimated man's entry at 70000 B.P. ± 30,000. Once in the New World, man's southerly migration was possible only intermittently because of ice barriers across Canada during glaciation. According to Stewart (1973), the most likely times for man's descent into what is now the United States was when land corridors opened through the ice east of the Rocky Mountains approximately 14,000-10,000 B.P., 28,000-23,000 B.P., and 50,000 B.P. However, if initial human occupation occurred earlier than 50,000 B.P., a likely migratory route might have been the now submerged paleo-coast of the Pacific United States.

It is not certain when the California coast was first occupied because worldwide rising sea level has submerged the archaeological remains of those early coastal dwellers. Sea level has varied greatly during recent and Pleistocene times. Sea level may have reached a low of 144 m (472 feet) below present mean sea level (MSL) 40,000 B.P. and 124 m (407 feet) below present MSL 18,600 B.P. This means that much of the early coastal region probably occupied by the earliest Californians is presently submerged, and at great depths in many areas. "Any traces of occupancy of California's coast and the lower reaches of river valleys during the period before 8000 B.P. to 7000 B.P. are likely to be covered over, either on the submerged shelf. . .or under alluvium deposited when river valleys were drowned by the rising ocean" (Bickle 1978:9).

Historic Development. California has a long history of international contact, beginning with Juan Rodriquez Cabrillo in 1542. Initial colonization by Spain, however, did not soon follow Cabrillo's voyage. According to Schuyler (1978:69): "Spain as an imperial power had been entrenched in the New World for over 250 years before California was added to her holdings." The founding of San Diego in 1769 marked a change in California cultural and settlement patterns. The Mission Period, during which 21 missions were founded by the Franciscans, had a drastic effect on the Native American population, which had numbered about 300,000 at the time of contact. Spanish control was lost in 1821 and California became a Mexican land. In 1833 the missions were secularized and much of their holdings was dispersed by land grants. Throughout the period of Spanish and Mexican rule the Native American population rapidly decreased as a result of war, disease, peonage, and slavery. Mexican rule ended in 1846, but mistreatment of the Native Americans did not. By this time the original population had been decreased by two-thirds to 100,000. By 1870 this number had been further reduced to an estimated 58,000.[a]

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[a] See Heizer and Almquist (1971) for a thorough discussion of the treatment of minorities in California history.

During the 19th century many Europeans and Asians immigrated to California to join the Americans from the eastern states who sought their fortunes in the Golden State. Some of the groups well represented in California development include the Chinese, Japanese, Filipino, Irish, Finns, Swiss, Scots, Yugoslavians, Italians, and Germans (Frederickson 1977). Immigrants continue to increase the population of Southern California, especially those from Mexico and Southeast Asia. Southern California remains an area of much cultural diversity. Although cultural assimilation continues, there remains a number of contemporary groups that continue to maintain distinctive ethnic identities and socio-economic ties within their communities.

Terrestrial Cultural Resources. The coastal lands contain numerous archaeological sites (see SAI 1978), most of which represent aboriginal resources. The heavier concentration of sites recorded in some counties is partially a reflection of large indigenous populations (e.g., Santa Barbara county), and partially the result of intensive surveying in recent years. There has recently been an increased interest in historical archaeology in Southern California, which has resulted in several recent nominations to the National Register of Historic Places. Several historic lighthouses have recently been nominated to the National Register: Point Loma, Long Beach Light Station, Los Angeles Harbor, Point Fermin, Point Vicente, Anacapa Island, and Point Conception. Southern California's long history has provided a wealth of cultural material, much of which is now being preserved for future generations.

Offshore Cultural Resources. The offshore region of the Bight is apparently rich in cultural resources. Types of submerged resources are aboriginal remains, and sunken ships and aircraft. The fields of prehistoric and historic marine archaeology have begun to develop only recently in this area. Thus far, most marine prehistoric work has occurred in San Diego, Los Angeles, and Santa Barbara counties. Hudson (1976) has provided a comprehensive review of previous investigations of submerged aboriginal remains along the Bight coast. A major importance of these resources to anthropologists is their potential contribution to knowledge and theory about man's beginning's in the New World. There is a relatively good chance that many submerged prehistoric resources have been preserved.

Shipwrecks are important resources in historical reconstruction because they represent an instant in the life of a culture and preserve it fairly intact. Preservation is especially good in an area like Southern California where the waters are deep and cold. Increasing numbers of shipwreck artifacts have been recovered offshore California in recent years, and more shipwrecks are being located every year, both by divers and by remote sensing surveys. BLM has records of 582 shipwrecks in the Bight region. Though the locations of historic shipwrecks have been in some cases precisely noted, they are often far, perhaps many miles from the location of their reported loss. Location errors have occurred because of navigational error, loss report error, and vessel drift. It is not uncommon for an abandoned sinking ship to drift for a long distance prior to submersion. For these reasons, it is important to understand there may be important historic wrecks in areas where none have been reported.

Contemporary Cultural Activities. The coastal portion of the Sale area contains several localities of concern to various resident contemporary ethnic groups.

There are several geographic landmarks and areas that are of special concern to indigenous Native Americans because of what would be termed by western thought as their "sacred" nature. However, the traditional Native American world view does not divide the world into things that are religious or non-religious, sacred or secular. Rather, the world is viewed as an integrated entity, and each thing that exists is part of the nature of the whole.

> The "religious" aspects of the lives of Native Americans can be only roughly categorized into separate considerations. Because of the particular nature of the Indian perceptual experience, as opposed to the particular nature of the predominant non-Indian, Western perceptual experience, any division into "religious" or "sacred" is in reality an exercise which forces Indian concepts into non-Indian categories, and distorts the original conceptualization in the process. (Theodoratus, Chartkoff, and Chartkoff 1979:44)

Some of the geographic sites of concern to contemporary Native Americans are important because they were traditionally used by their ancestors. Some of these places are still being used in traditional ways. For example, Point Conception is a well known location of great importance to the Native American community. It is the "Western Gate" through which souls pass on their way to the after world.[a] In addition, especially in the Santa Barbara area, there has been a resurgence of interest in indigenous practices and beliefs that has resulted in a syncretic religious movement involving both young and old. The result has been that some traditional ways have been adopted not only by those individuals for whom these beliefs and practices have been a part of their cultural experience from childhood, but by those for whom this has not been the case.

The intertidal zone of the Bight is the object of intensive gathering activities by members of various ethnic groups, including Mexican, Filipino, Japanese, Korean, Vietnamese, Cambodian, and Hawaiian. The gathering of intertidal biota is, for some, like the Japanese, a recreational activity for the family, which may spend "a day at the tides." For others, it is a subsistence activity that provides an important amount of protein for the diet. This is especially true for illegal aliens (California Fish and Game Dept., personal communication 1980). Most of the gathering activities, both recreational and subsistence, are illegal. However, law enforcement has been relatively ineffective because of budget limitations and the intensity of these activities.

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[a] Other than Point Conception, no attempt has been made to list significant sites, in order to protect them and the individuals presently using them. Although BLM is aware of the locations of some of these sites, there may be others as yet undocumented. The Native American Heritage Commission has recently undertaken a research project to inventory sacred areas in California.

10. Visual Resources: The Southern California coastline is extremely diverse in its variety of landforms and cultural modifications. These vary from rugged cliffs to flat sandy beaches, and from completely pristine to densely developed areas. Since the conception of what is aesthetic or beautiful is wreathed in human creativity, emotion, philosophical standards, and cultural background, widely divergent views can emerge from any discussion of visual resources. Certain principles do emerge which are suitable for analytical treatment. These are primarily concerned with the visual perception, as other types of stimuli such as sound and smell are fairly easily characterized as pleasant, neutral, or unpleasant. Visual attractions such as the dramatic meeting of land and water, the framed and unframed views of the ocean, the texture of the vegetation and urban areas, and the overall harmony of the scene add or detract to the quality of life for coastal residents and visitors, and will contribute to the economic success of the tourist industry by attracting vacationers to the shoreline.

The systematic analysis of scenic quality is a complex and difficult task because of the great variety of natural and man-made conditions along the California coast. The Bureau of Land Management had developed a rating system that attempts to objectively rate, on a regional scale, the visual quality of the various landscapes on the California coastline. This system is based on a landscape architectural viewpoint (see Technical Paper No. 81-5 for details), and has incorporated the texture, harmony, variety, cultural modifications, vegetation, and form of the area into the rating methodology.

The results of rating the coast are summarized in Technical Paper No. 81-5.

D. Future Environment Without the Proposal

1. Expected Change in the Physical Environment

a. Geology: It has been claimed by some that seismic activity may be precipitated or accelerated by OCS drilling and development activities. The validity of such a claim is to date unknown, though future rig monitoring studies may answer questions of this nature. At the present time, it is impossible to assess how future seismic activity might be affected by the proposal.

The relative activity of oil and gas seeps may be another geologic phenomenon affected by OCS activity (see Section III.A.1.b). Again unknowns prohibit an accurate assessment of how many phenomena may be influenced by the proposed action.

In general, it appears that the geologic environment is not expected to be significantly affected by OCS development, with the exception, of course, that the future environment without the proposal would include the presence of the estimated reserves noted in Table I.B.1.a-1 retained in their given reservoirs rather than extracted over the lifetime of the proposal.

b. Physical Oceanography: Physical oceanographic characteristics of the Lease Sale No. 68 region are expected to remain substantially the same as conditions since the Holocene (about 10,000 years ago). Current understanding of the forces which drive long-term variations in oceanographic regimes coupled with the irregularity and meagerness of data base make long-term (or even yearly) predictions of currents, waves, temperature, etc., with any degree of confidence highly dubious.

c. Water Quality: Water quality in the Lease Sale No. 68 nearshore region is expected to continue to degrade, in general, even without the proposal. Increased amounts of domestic and industrial sewage are expected along with an increase in thermal effluents added to the marine environment from new facilities, such as the San Onofre Nuclear Generating Plant. Two exceptions to the general continued water degradation will be the decreased amounts of organic pesticides (chlorinated hydrocarbons) and polychlorinated biphenyls (PCB's) and decreased amounts of some trace metals (silver).

d. Meteorology: With the exception of air quality, basic meteorological conditions should remain fairly constant, with or without the proposal. Air quality impacts, relative to the future environment are discussed in Section III.D.1.e.

e. Air Quality: Under the Clean Air Act Amendments of 1977, regions that currently exeed the Federal air quality standards must prepare a plan to meet that standard and to maintain compliance with this standard in the future. These plans must show how standards are to be met by 1982, using a combination of stationary source, mobile source, and transportation controls. The attainment date for meeting the standards for carbon monoxide and oxidant has been extended to 1987, since attainment by 1982 was considered impossible even after the application of all reasonably available control measures. Thus, based upon legally enforceable air pollution control plans and existing air quality regulations, the entire study area should meet the air quality standards by 1987. Lack of adequate gasoline supplies and fuel conservation efforts may reduce automobile use which would tend to reduce regional vehicular emissions and, therefore, improve future air quality. Conversely, until the California legislature approves an inspection program for automobile emission control devices, future attainment of the standards is not a certainty.

2. Expected Changes in the Biological Environment

a. Plankton: Plankton populations should remain substantially the same as present in the Southern California Bight. Very little is known of long-term trends in species composition of plankton communities, either phytoplankton or zooplankton, and it is therefore impossible to predict much into the future. Increased water quality degradation due to increased volumes of municipal discharges and associated elevated levels of nutrients may result in pollution-tolerant plankton becoming established. More tropical species of plankton may invade and become established in areas which receive thermal effluent from power plants.

b. Benthos: Forecasting the future of a complex environment like the Bight over the next 25 years is extremely difficult because of the many variables involved. However, with the inevitable population expansion and development along wetlands and the coast of Southern California, some corresonding impact to the benthic environment is expected. Although the rate of degradation will be decreased due to State and local commitments and legal mandates, the amount is unquantifiable and unpredictable except in general terms.

The principal non-oil effects to the subtidal benthos will probably come from pollution and waste disposal, while the principal non-oil impact to the intertidal will be from pollution and direct human trampling and souvenir collecting, both largely a function of population growth. At the same time, there have been two previous lease sales in the Bight which have a probability of oil spills. Although the oil potential is proving to be less than predicted in the early 1970s by Western Oil and Gas Association (OCS Sale No. 35 EIS in: U.S. Department of the Interior, 1975), the amount of oil available and spill potential from these sales is still theoretical.

c. Fish and Fisheries: Commercial and sport fishing are expected to increase as the population in Southern California grows. The amount of each species be caught will depend in part on fish abundance, weather conditions, and harvest regulations. Commercial fish landings are also greatly influenced by market demand. Since our marine resources are limited, careful management will be essential to their survival. However, fisheries management is very difficult and large increases and decreases in populations are anticipated. These changes will affect the population sizes of other species, whether these species are fished or not. Without the proposal, the potential for oil spills and their predicted impacts will be less but still could result from existing oil and gas activities. Changes in population sizes also will be caused by other activities, particularly domestic and industrial pollution.

d. Marine Mammals and Seabirds

i. Pinnipeds: The California sea lion, the most abundant pinniped encountered in the Southern California Bight (SCB) during the survey of Dohl, et al. (1980), was severely reduced in numbers by commercial hunters in the early part of this century. The Southern California population has substantially recovered in recent years and is considered to be stable (Dohl et al. 1980; Bonnell, personal communication 1981). The northern fur seal and the northern elephant seal, both commercially desirable species in the late 1800s and early 1900s, have recently shown substantial increases in numbers within the SCB (Dohl, et al. 1980). Harbor seals within the SCB are also showing steadily growing population numbers and currently represent approximately 30 percent of the state's total. The Steller sea lion SCB population is declining, with no animals sighted in the area during 1980 (Bonnell, personal communication 1981). According to Dohl et al. (1980), this species has a large population of undetermined size in the Gulf of Alaska. The Guadalupe fur seal, a rare visitor to the SCB, was exploited to near-extinction in the late 1800s. The world population, currently centered on Isla de Guadalupe, Mexico, appears to be recovering at a slow but satisfactory rate (Fleischer 1979; Dohl, et al. 1980). Assuming that this population trend continues, more vagrant Guadalupe fur seals could be observed in the SCB in coming years.

ii. Non-Endangered Cetaceans: Dolphin and porpoise species which are commonly encountered in the SCB include the common dolphin, Pacific white-sided dolphin, Dall's porpoise, Pacific bottlenose dolphin, Northern right whale dolphin, grampus, and Northeastern Pacific long-finned pilot whale. Due to the difficulties encountered in censusing these species, population growth trends are unknown, although each SCB population is considered to be healthy (Dohl, et al. 1980).

iii. Non-Endangered Seabirds: The vast majority of seabird species sighted in the SCB are not resident, being either visitors or migrants to the area on a seasonal basis (Dohl, et al. 1980). Briggs, et al. (1978) indicate that the total number of migrant seabirds visiting the Bight fluctuates from year to year. Resident seabird populations in the SCB appear stable (Hunt, et al. 1978), although many of the nesting species remain susceptible to human disturbance, natural and introduced predators, habitat loss, and environmental pollution, among other factors.

iv. Discussion: Within the limitations of current censusing techniques, pinniped populations which frequent the Bight appear to be healthy and stable. If environmental conditions do not appreciably change in the future, current population trends for SCB pinnipeds should be maintained. In most cases, the growth trends for non-endangered cetacean species within the SCB are unknown. Resident and migratory seabird populations within the Bight are considered stable but highly sensitive to environmental degradation.

e. Endangered and Threatened Species: Six federally-listed endangered whale species are known to occur within the waters of the Southern California Bight (SCB). Those individuals sighted during the three-year study of Dohl, et al. (1980) included representatives from the blue, finback, gray, humpback, Sei, and sperm whale species. Another whale species, the endangered Pacific right whale, had been sighted previously in California offshore waters but was not seen during the most recent survey (Dohl, et al. 1980) of marine mammals and seabirds of the SCB.

The gray whale population, by virtue of its breeding and migratory habits, is relatively easy to census. Dohl, et al. (1980) have shown that the gray whale population is increasing in size, representing a potentially stable population. If environmental conditions do not appreciably change in the future, current trends for the gray whale population should be maintained. The remaining endangered whale species present within the SCB are more difficult to census for a variety of reasons. Blue and finback whale populations, two of the most common large whale species encountered in the survey, were noted throughout the SCB, particularly offshore in the vicinity of the Santa Rosa-Cortes Ridge. Humpback, Sei, and sperm whale populations were less frequently seen, preferring offshore areas. As a result, population trends for these species are relatively unknown and predictions as to future changes in these whale populations cannot be determined.

The southern sea otter, a federally-listed threatened species, is highly susceptible to losses of insulation and subsequent hypothermia as a result of contamination by oil. Since offshore oil transportation will continue even without further OCS development, it is anticipated that some sea otters will die in the event an oil spill occurs and strikes some portion of the sea otters' range. Studies are currently being conducted by the FWS to determine the feasibility of transplanting a portion of the sea otter population to San Nicolas Island. If successful transplants occur, the threat from an oil spill to the southern sea otter population should be reduced.

The California Brown Pelican population within the SCB occupies the northern limit of its breeding range. The boundaries of a species' range are established when a number of minimal and maximal environmental conditions are encountered. Thus, a relatively minor change in one or more environmental parameters critical to the brown pelican could have a major effect upon the population. Since the reproductive success of this species within the SCB has fluctuated in recent years, it is expected that the brown pelican population will continue to fluctuate in the future.

The California least tern was formerly a common breeding resident on the mainland, nesting in undisturbed sandy beach habitats. Although this species' reproductive failures and radical reductions in population size have been attributed to disturbances of nesting areas, the population is considered to be stable due to a recent habitat management program (Dohl, et al., 1980).

The California clapper rail and the light-footed clapper rail, two federally-listed endangered subspecies, are residents of select coastal salt marshes and estuaries of the California coast. The light-footed clapper rail, the only clapper rail found along the southern California shoreline, is known to be extremely susceptible to habitat destruction (e.g., marsh reclamation) and pollution. The southern California population is considered to be stable (S. Wilbur, personal communication 1981), due in part to implementation of the Light-footed Clapper Rail Recovery Plan and the acquisition of select marsh and slough areas as public lands.

The American peregrine falcon and the southern bald eagle were common throughout the Channel Islands during the 1930s. Since the 1950s, both species have been expatriated from the islands. Successful transplantation of bald eagles has occurred on Santa Catalina Island. Recolonization of the islands by the peregrine falcon from an increasing mainland population may occur naturally (National Park Service 1980). The successful recolonization of the Channel Islands by these two species will result in a decline in the number of seabirds, a common prey species of the peregrine falcon and the bald eagle.

The California Condor population is declining. A captive breeding program has been initiated in an attempt to reverse this decline.

The list of endangered flora from San Clemente and Santa Barbara Islands includes the San Clemente Island (SCI) broom, SCI bushmallow, SCI Indian paintbrush, SCI larkspur, and Santa Barbara Island (SBI) liveforever. Among the endangered fauna for these islands, the list includes the San Clemente loggerhead shrike and the Santa Barbara song sparrow, with the San Clemente sage sparrow listed as a threatened species. Endangered plant species have been designated as such because of the physical destruction resulting from the presence of introduced grazers (e.g., goats, sheep, rabbits) on the islands. Physical destruction of the native plant species has subsequently resulted in a loss of habitat for the endangered fauna. Efforts are being made to eliminate the introduced species from the islands. In the event that the eradication efforts are successful, the chances for the recovery of these species to their former numbers would increase. The sole exception to this scenario lies with the Santa Barbara song sparrow, a species that may extinct (FWS, 1980).

Endangered or threatened sea turtle species are rarely observed in southern California since the SCB is considered as the northern limit of their range. Recent sightings within San Diego and Long Beach harbors are attributed to migrant individuals. No breeding of these species is thought to occur in southern California (J. Lecky, personal communication 1981) and the current population status within the SCB is not known.

f. Sensitive Biological Areas: The above discussion of intertidal benthos (III.D.2.b) can be applied here since most of the legal Sensitive Biological Areas are intertidal areas. Their future will primarily depend upon the quantity and quality of domestic pollution, enforcement and prevention of intertidal collecting, and reduction of the amount of human traffic allowed on the sensitive areas.

The largest impact from previous oil activity will depend upon the number, quantity, and frequency of spills reaching the sensitive areas. Although unpredictable, except in the most general terms, one can estimate that areas having the greatest amount of oil development, coupled with high oil spill hit probabilities based on the oil spill model, will have the largest potential for oil spill impact from previous oil leases. Based upon these considerations, the areas of greatest oil spills concerns are: Channel Islands National Park and Marine Sanctuary, other areas within the Santa Barbara Channel, and mainland areas just to the south of the San Pedro Shelf.

g. Marine Sanctuaries: Resources within the Channel Islands Marine Sanctuary are regulated by the National Marine Fisheries Service, National Park Service, and The California Department of Fish and Game. There is some probability of adverse effects to biological resources within the Sanctuary from oil spill(s) resulting from previous lease sales and existing tankering activities. Although the impact on subtidal benthos and shallow water fish is not as well known as that of intertidal species, available evidence suggests it is less severe. Thus, intertidal species are at a greater risk from past or future lease-related activities. Without Sale No. 68, there is moderately less risk to biota within the Sanctuary.

h. Terrestrial Resources: The future of terrestrial biological resources will continue to be impacted from factors resulting from human population expansion, the extent of which will depend upon the Coastal Commission and local government and their philosophy during the next 25 years.

3. Expected Changes in the Socio-Economic Environment

a. Demography: The population estimates shown in the Table III.D.3.a-1 are taken from the Harris Model. Population increases forecast by the Harris Model are expected to occur in the study area as a result of natural increases plus migration associated with new or expanding economic activity such as previous OCS lease sales, State tidelands oil development, the Space Shuttle project, the Missile-X program and the LNG terminal construction. This forecast does not account for activity which may result from leasing in State waters north of Point Conception as these estimates are not presently available. Population forecasts vary due to differing assumptions concerning net migration and natural increases. For comparison, projections made available by the State of California, Department of Finance, for the years 1981 and 1982 are shown in parentheses below the forecast made by the Harris Model. Although the distribution of population in these two estimates differs slightly, the regional totals are in close agreement. From 1982 through 2007, population in the study area is forecast to grow by about 1.5 percent per year.

b. Coastal Economy: The California economy in 1981 is expected to grow in real terms faster than the U.S. as a whole (United California Bank, 1980). Primary factors affecting growth are a further expansion in numbers of aerospace-defense contracts and in output in the computer and electronics industries. Exports of California products are also projected to grow, especially agricultural products and aircraft and electrical (communications) equipment. A prime growth-inducing factor is foreign investment which is expected to be continued to be attracted to California. This investment will provide new funds and expansion of jobs.

The Harris Model forecasts jobs, earnings, value added and other economic parameters for the 25-year study period. In terms of jobs and earnings, the five leading industrial sectors in the study area through the 1990s will be: retail trade; medical and educational institutions; federal civilian government; finance, insurance and real estate; and manufacturing. Table III.D.3.b-1 shows selected economic variables forecast by the Harris Model for the Sale No. 68 Study Area.

c. Public Facilities and Services: Expansion of local population and employment may exert pressures on the ability of communities to provide public facilities and services. As a result of an inventory of the current and projected level of services provided in the study area, potential constraints on growth were identified.

Water Supply: A limitation on water supply could occur in the early 1990s to areas within the 6-county (including portions of Ventura, Los Angeles, Orange and San Diego Counties) service area of the Metropolitan Water District (MWD). Two situations combine to produce the potential shortage. In 1985, the MWD allotment from the Colorado River will be cut by 662,000 acre feet per year (to 55 percent of the present allotment). Secondly, there is some doubt that the Peripheral Canal will be built. If it is not built as part of the State Water Project to carry water around the Sacramento/San Joaquin Delta, the MWD will not be able to receive its full contract allotment from that source. By

TABLE III.D.3.a-1

STUDY AREA BASE POPULATION FORECASTS
WITHOUT SALE NO. 68 ACTIVITY

County							
Year	1981	1982	1987	1992	1997	2002	2007
Santa Barbara	308,655 302,600[a]	320,308 306,700[a]	338,273	351,420	352,383	361,658	380,889
Ventura	526,792 529,200[a]	542,521 544,000[a]	609,004	669,122	718,275	769,190	829,366
Los Angeles	7,253,151 7,197,700[a]	7,353,954 7,236,900[a]	7,931,588	8,561,804	9,231,570	9,962,378	10,792,304
Orange	1,929,675 1,959,900[a]	1,963,017 2,004,500[a]	2,125,916	2,279,377	2,418,807	2,565,199	2,739,292
San Diego	1,862,773 1,896,200[a]	1,918,342 1,943,400[a]	2,164,778	2,391,788	2,596,227	2,788,993	2,986,322
Regional Total	11,881,046 11,855,600[a]	12,098,142 12,035,500[a]	13,169,559	14,253,501	15,317,262	16,447,418	17,728,173
California	23,369,920	23,791,640	25,981,448	28,220,468	30,175,928	32,194,704	34,466,872

Source: Curtis Harris Model

[a] State of California, Department of Finance

TABLE III.D.3.b-1

SELECTED ECONOMIC BASE PROJECTIONS[a]
WITHOUT SALE NO. 68

Year	Civilian Labor Force	Private Investment	Personal Income	Value Added[b]	Gross Regional Product[b]
		1976 Dollars			
1982	5,267,134	18,314	102,969	115,830	128,865
1987	5,949,465	20,644	126,109	141,703	157,061
1992	6,528,477	22,786	147,318	167,128	184,834
1997	7,100,754	24,986	170,762	194,491	214,677
2002	7,719,648	27,635	197,265	226,004	248,885
2007	8,441,042	30,868	228,924	263,680	289,670

[a] Includes Santa Barbara, Ventura, Los Angeles, Orange and San Diego Counties.

[b] Expressed in thousands.

the early 1990s, there could be water shortages in many communities, particularly in Ventura and Los Angeles counties.

Santa Barbara County obtains its water primarily from the water resources of the Santa Ynez River Basin and groundwater supplies. After 1990, deficiencies are likely unless there are changes in the water supply system and/or reductions in use.

Wastewater Treatment: Need for additional capacity for wastewater treatment is also projected for the near future in certain small sanitary districts in Santa Barbara County as well as the north coast area of Ventura County (north of Ventura River).

d. Coastal Land Use: In this discussion about future land use, Local Coastal Program (LCP) documents and the California Coastal Plan (1975) were used as basic sources. It is important to realize that: 1) future land use will be determined by the local jurisdictions once their LCP has been certified, and 2) that while land use intent can be determined from the LCPs they can be amended to accommodate other land uses not initially permitted. Therefore, the expected changes in the land use will be a reduction in open land, due to the encroachment of residential development on the backshore areas, and a possible increase in the number of recreational sites along the shorefront.

This change in use could be very significant due to the potential destruction of sensitive ecological habitats. An example of this is the proposed development of Bolsa Chico Marsh which is a nesting place of the Least Tern and Belding's Savannah Sparrow, and considered a highly sensitive ecological area. However, the overall land use spectrum of the area will remain essentially unchanged.

e. Recreation: The expected change in recreational activities without the proposed sale would still be an increase in amount of participation and construction of facilities. This is due to more time being available to people for leisure activities. The restraints on this growth are available cash and availability of gasoline, and this would tend to cause people to utilize facilities closer to their towns than are presently used.

Gathering by ethnic groups will continue to be a problem, because of excessive stress being placed on the intertidal areas by over-harvesting. This has an impact on recreation by reducing or eliminating tidepooling and/or sportfishing in the affected area due to the decimation of the resource. Controls over the gathering are enforced by the California Dept. of Fish and Game, however, illegal excessive gathering will tend to continue among certain ethnic groups who depend on the intertidal zone as a major food source. (See Sections III.D.2.a and III.D.3.i.)

Tourism will continue to increase due also to the increase in available time and money; however, if there is a reduction in the available supply of gasoline, there is expected to be a drop in tourism in the affected area, as was seen in the 1974 and 1979 gasoline shortages.

f. Oil and Gas Infrastructure: Without the proposal, there would be an increase in tankers to Southern California to replace the loss of potential Sale No. 68 oil and natural gas. There would be an increase in Alaskan and foreign crude to Los Angeles Basin refineries. Also, there would be an increase in liquified natural gas (LNG) to the Point Conception LNG Facility.

Bonner and Moore Associates (1980) have forecasted that there could be an increase of 18 percent in crude demand to California refineries from 1978 to 1985, based only on product demand growth. Also, for March 1980, there were approximately 16 percent foreign and 36 percent Alaskan (assumed as interstate) crude received at California refineries (III.C.6). Consequently, loss of Sale No. 68 crude could be replaced either by Alaskan or foreign crude. On the assumption that a 120,000 dwt tanker could represent either Alaskan or foreign shipping, it was estimated that approximately 3.2 tankers (120,000 dwt) per month would be needed to replace the estimated Sale No. 68 crude for 1990 (Technical Paper No. 81-1).

On the assumption that Point Conception LNG facility is in operation during Sale No. 68 production, and that the loss of Sale No. 68 produced gas would be replaced with LNG, it was estimated that approximately 0.6 LNG tankers (165,000 cubic meters) per month would be needed to replace Sale No. 68 gas. Replaced Sale No. 68 gas represents produced gas during 1990 from the Santa Barbara Channel and Inner Banks areas (POCS Technical Paper No. 81-1).

g. Transportation Systems: Commercial vessels using the Traffic Separation Scheme through Santa Barbara Channel would increase approximately from 19 to 38 percent from year 1980 to 2000. The proposed LNG project could result in LNG tankers from Alaska and Indonesia to the LNG terminal at Point Conception. There could be an increase in foreign and Alaskan tankers carrying crude oil and LNG to the Southern California area to replace the loss of potential Sale No. 68 crude oil and gas. The Space Transportation System at Vandenberg Air Force Base could use barges to transport spent rocket boosters between Port Heuneme and Vandenberg Air Force Base. The proposed onshore pipeline from the Santa Barbara Channel could be in operation resulting in a reduction in local tankering or barging from the Santa Barbara Channel to Los Angeles county ports (FEIS Sale No. 48). For 1980, there were approximately 10 vessels (tankers and barges) per month transporting crude from Santa Barbara Channel area to Los Angeles (LA) basin refineries. This estimate was based on the assumption that all vessel arrivals to the six mooring locations in Santa Barbara Channel (Cojo Bay, Gaviota, Ellwood, Carpenteria, Ventura, and Ventura River) transported crude by vessels to LA basin. From November 1, 1979, to October 31, 1980, there were 121 vessel arrivals at above six mooring locations (Teerven, J., Lt.).

Oil and gas exploration, development, and production activities from existing Federal and State leases would increase. Increased activities include drillships, platform and pipeline construction, crew and supply boats, and helicopters.

h. Military Uses: Without OCS Sale No. 68, impact to military operations in the Southern California Bight will be minimized. Other uses of the area are increasing all the time as ship traffic and recreational uses related to the increasing demands and population density in the coastal counties goes up. There are thought to be significant hydrocarbon deposits in the Southern California offshore area. Since nearly all of this area is used by the military, it is quite likely that the co-usage problem will continue to exist and be evaluated as each future OCS Sale is evaluated.

i. Cultural Resources: With increased residential and industrial development, the coastal lands will be more intensively surveyed for archaeological sites. As a result, more resources will be identified and archaeological data will increase. Although some mitigation will be undertaken in most cases, it is likely some damage and looting will occur. There will be continued deterioration with age of some historic landmarks, but the current interest in protection and preservation, if it continues, will positively affect an even greater number of these sites than at present. Coastal Native Americans will find subsistence and ceremonial gathering increasingly difficult as the supply of traditional foodstuffs decreases. Other ethnic groups will find intertidal gathering increasingly difficult with a decrease in supply and a possible increase in law enforcement efforts. Acculturation with western culture will also decrease gathering efforts. For a discussion of how these collecting activities affect the intertidal benthos and sportsmen see Sections III.D.2.b and III.D.3.e.

Offshore aboriginal artifacts and sites and historic shipwrecks will be subject to continued artifact hunting by sport divers. Some submerged cultural resources will be destroyed or damaged by natural forces as they continue to lie on the bottom. However, those historic and prehistoric resources protected by sediments or in deep cool waters will continue to be preserved for a great many years.

j. Visual Resources: Without the proposal, the expected change in the visual resources of the area will be relatively minor, and restricted primarily to increases in residential development along the backshore, and the development of recreational facilities along the shore. This will tend to cause a slight reduction in the quality of the visual resource. This development will be controlled by local coastal plans and will be the responsibility of the local areas. Overall, the quality of the visual resource is expected to remain at about the present level with minor changes.

CHAPTER IV

IV. ENVIRONMENTAL CONSEQUENCES

A. Significant Impact Producing Agents

1. Oil Spills: The USGS Oil Spill Risk Analysis model has been described (Lanfear, et al. 1979; and Smith, et al. 1980) and run for previous California OCS Oil and Gas sales (BLM 1979; and BLM 1980). The model has been upgraded and increased in complexity each time it has been applied to a Sale. For this Sale, the various trajectory data tabulated by USGS (Samuels, et al. 1981) is 204 pages and combined with the required analysis is too lengthy to include in the body of this EIS. The following data represents a summary of the results showing the resultant probability of potential oil spill impacts based on historical data. For a more detailed analysis, which requires looking at the conditional probabilities upon which the probabilities of oil spill impact are determined (including seasonal breakdowns), the analyst can refer to POCS Technical Paper No. 81-2, entitled "Oil Spill Risk Analysis of Proposed OCS Sale No. 68 Offshore Southern California." The original data from which all the above analysis is accomplished can also be obtained from USGS (Samuels, et al. 1981).

a. Oil Spill Model

Description. For a detailed technical description of the Oil Spill Risk Analysis Model, the reader should refer to the references noted in the previous paragraph. Basically, targets, shoreline segments, wind and current information is entered into a computer. A point, stimulating a spill is started from a preselected location (normally the center of the tract to be evaluated), and moved in 3-hour increments using the vector sum of wind and surface ocean current information. The spill is tracked until it (the point) impacts a target or a simulated 30-day period has elapsed. Data is tabulated representing 3-, 10- and 30-day intervals. This data is referred to as the "conditional probability" (spill impact probability assuming a spill has occurred). The risk of a spill occurring is based on historic accidents and is a function of the amount of oil produced from a field. The risked data is combined with the conditional probability and is used to determine the probability of an oil spill impacting a particular location or resource as reflected in the following tables.

i. Model Parameters: Exploration and development launch points: Simulated oil spill launch points were taken from each of the proposed tracts shown in Figure IV.A.1.a-1. This information was combined in clusters as shown within the polygons and designated as subdivisions a1 through a10 for the purpose of assigning resource values to·determine the probability of spill occurrence.

Transportation Launch Points. Simulated oil spill launch points were used along the routes shown in Figure IV.A.1.a-2 to determine the probability of spills occurring during transportation of oil in the Southern California

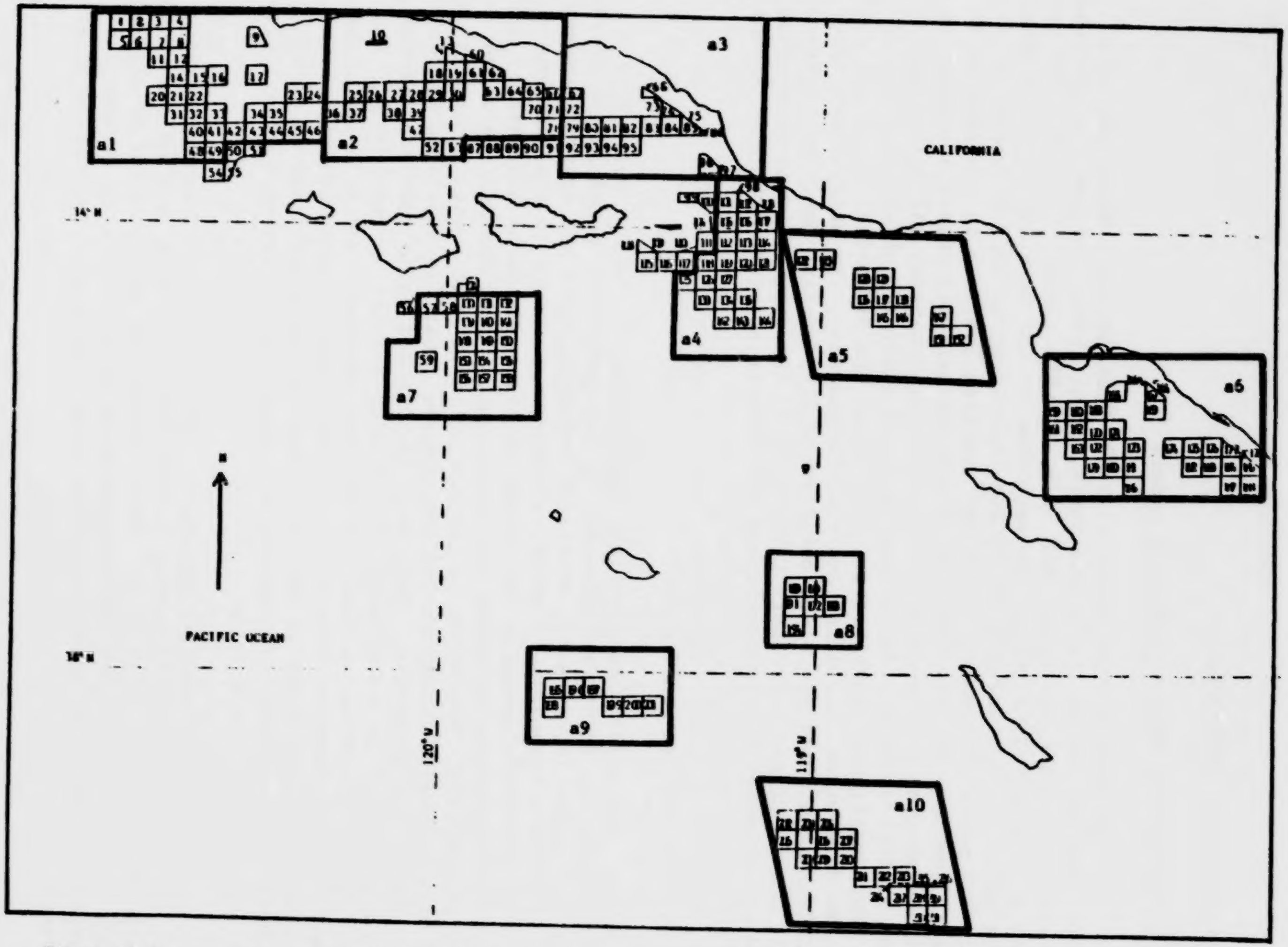

a1
a2
a3
a4
a5
a6
a7
a8
a9
a10
CALIFORNIA
PACIFIC OCEAN
N
34° N
33° N
120° W
119° W

Figure IV.A.1.a-1 Map showing the ten subdivisions (a1-a10) of the proposed lease tracts (P1-P221) for Southern California OCS Lease Sale No. 68. Tracts not included in any subdivision are within the proposed marine sanctuary and are treated separately.

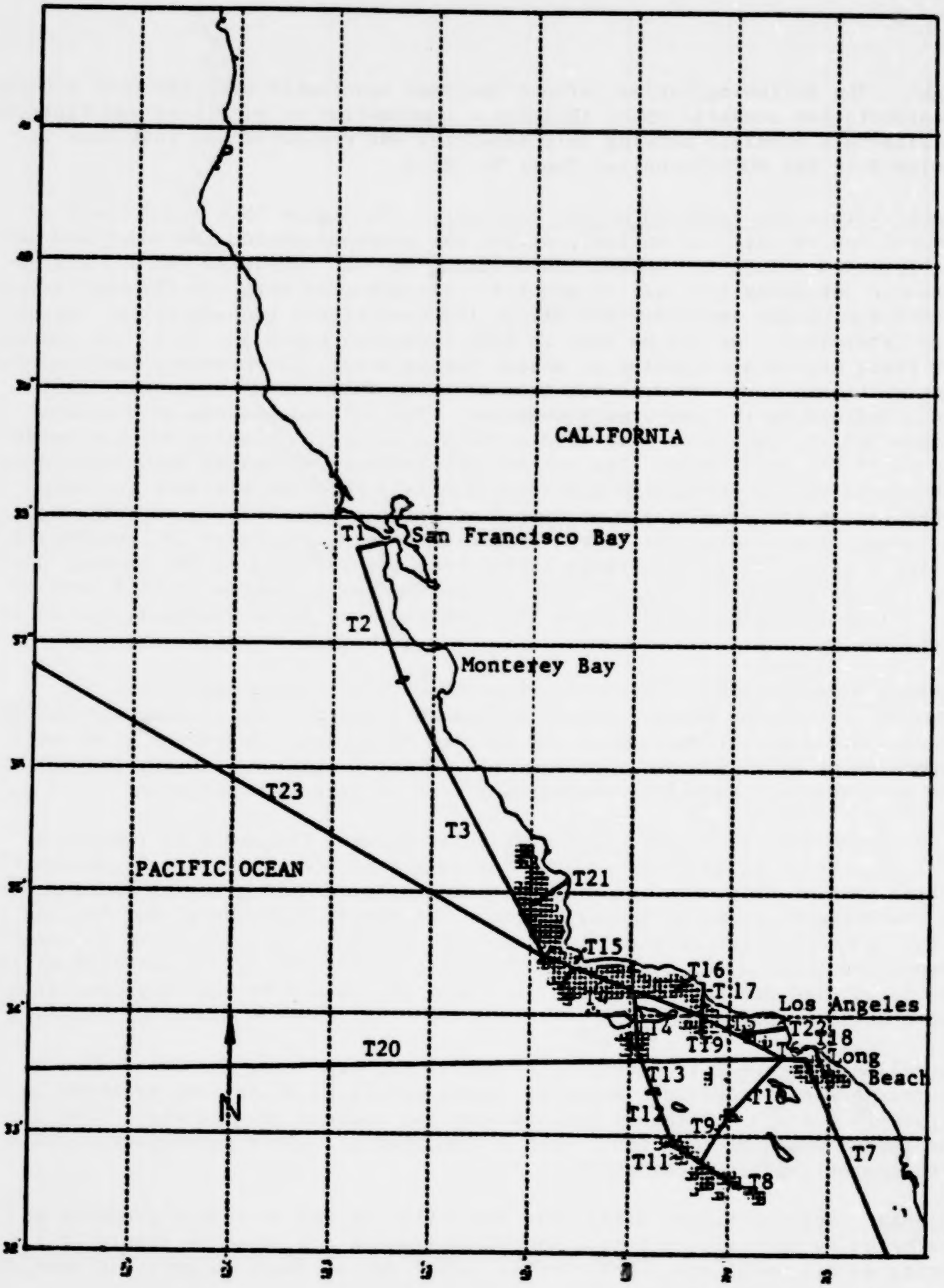

CALIFORNIA
T1
San Francisco Bay
T2
Monterey Bay
T23
T3
PACIFIC OCEAN
T21
T15
T16
T17
Los Angeles
T22
18
Long
Beach
T14
T19
T20
T13
T10
N
T12
T9
T11
T8
T7
40
39°
38°
37°
36
35°
34°
33°
32°

Figure IV.A.1.a-2 Map showing the transportation route segments (T15 to T18 and T21, T22 are proposed pipelines; T1 to T14 and T19, T20, T23 are proposed tanker routes), polygons represent proposed and existing lease tracts.

Bight. The following tables reflect the risk associated with the most probable transportation scenario which includes a combination of pipelines and tankering. An alternate scenario showing only tankering was evaluated and that data is included in the POCS Technical Paper No. 81-2.

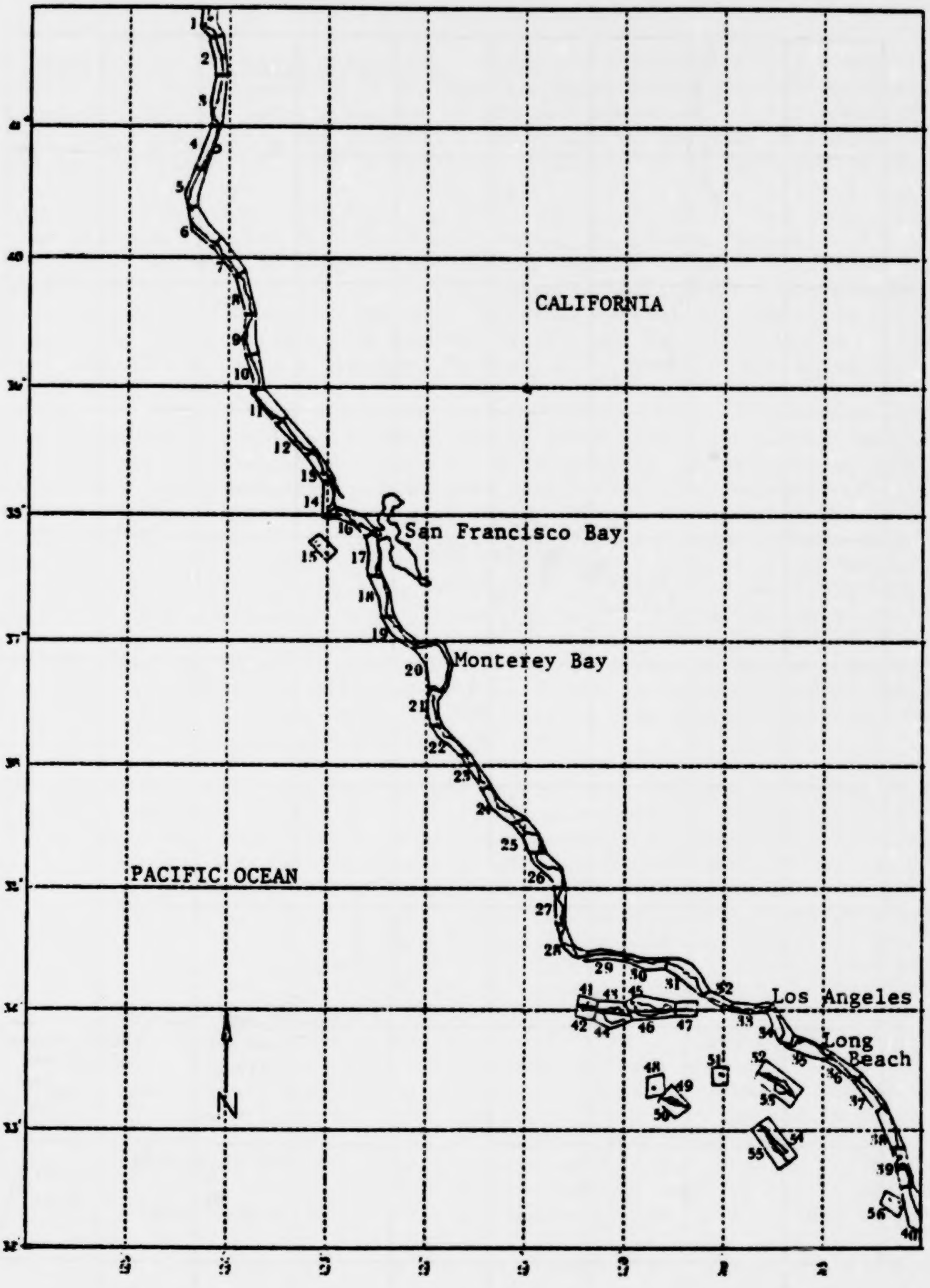
Tracts Within the Proposed Marine Sanctuary. In Figure IV.A.1.a-1 there are several tracts that lie entirely within the proposed marine sanctuary and were not included within the boundaries defining the ten sub-areas for oil and gas resource estimates (a1, a2, a4 and a7). Trajectories were run for the tracts within the marine sanctuary and values for conditional probability of impact were determined. As can be seen in POCS Technical Paper No. 81-2, the values for these tracts are similar to nearby tracts within the boundary and therefore, the few tracts involved will not skew or change the values for the overall areas defined by the sub-area boundaries. The oil and gas resource values determined for each area also have a certain variance allowing for the uncertainty of the input data. The oil and gas resource estimates associated with the tracts within the marine sanctuary are less than the variance for each sub-areas so the probability of impact on various resources is not affected by including or excluding the tracts within the marine sanctuary in the overall oilspill runs. Therefore, these tracts were not included in the overall run. The only effect that leasing tracts within the marine sanctuary will have on the oil spill analysis will be in the time required for a potential spill to reach shore.

Surface Ocean Currents. Surface ocean currents were programmed into the computer reflecting monthly values between 0.1 and 0.5 knots using the CALCOFI geostrophic flow information as the primary data base. Nearshore areas were augmented by data obtained from specialized local studies when the information was available and satellite photography used to fill in other gaps.

Wind. Wind data is limited to a particular format, frequency of reporting (1-hour intervals, 24 hours a day), and length of time (at least 5 consecutive years) that at this time can only be provided by certain stations which report to the National Climatic Center. Arcata, Monterey, Vandenberg, San Nicolas Island and San Diego were selected as being the most representative in their respective areas along the coast. This data is reduced to a transition matrix and is applied during a spill run in 3-hour increments by the computer using a Monte Carlo technique.

Shoreline Segments. To determine potential impact areas, the California shoreline was divided into segments approximately 27 miles long as shown in Figure IV.A.1.a-3. Offshore islands have two numbers to show which side of the island would be impacted. When a simulated oil spill run impacts a shoreline segment, it is terminated.

Targets. Special target areas that are either at sea or cannot properly be evaluated by inclusion within a shoreline segment are shown in Figure IV.A.1.a-4. During an oil spill run, when a spill "hits" one of these targets, it does not terminate, but keeps going.



CALIFORNIA
San Francisco Bay
Monterey Bay
PACIFIC OCEAN
Los Angeles
Long Beach
N
1
2
3
4
5
6
7
8
9
10
11
12
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Figure IV.A.1.a-3 Map showing the division of the Southern California shoreline into 56 segments of approximately equal length.

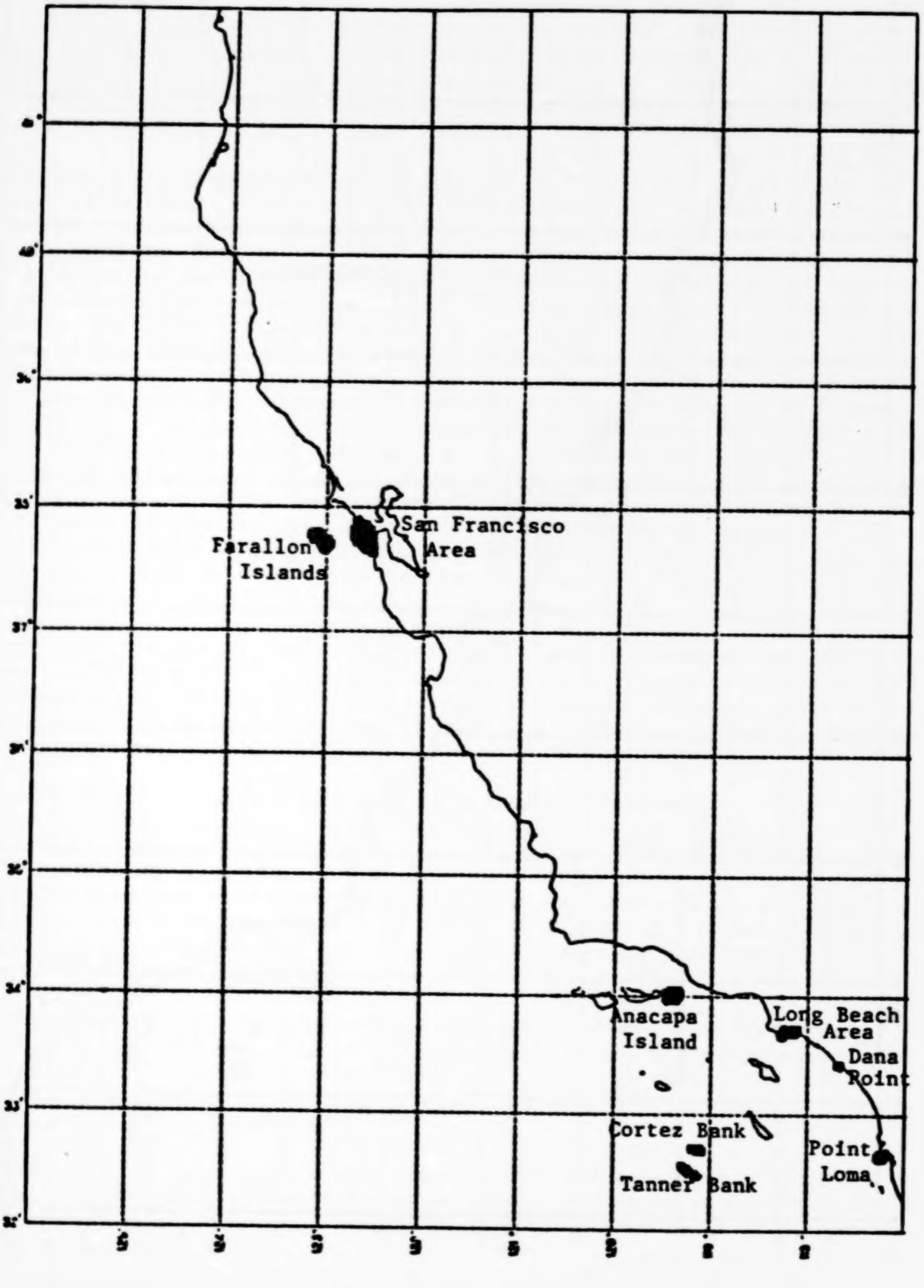
San Francisco Area
Farallon Islands
Anacapa Island
Long Beach Area
Dana Point
Cortez Bank
Tanner Bank
Point Loma

Figure IV.A.1.a-4 Map showing the locations of eight targets, Southern California OCS Lease Sale 68: cross hatching indicates areal extent.

Probability of Oil Spill Occurrence. There are currently 23 oil refineries (Table III.C.6-1) operating in the Southern California area that require an input of 1,365,420 barrels per day of oil when operating at full capacity. This means that during the probable 25-year life of the Sale 68 fields 12.5 billion barrels of oil must be provided. Whatever is not produced in the area will have to be imported and transporting oil has historically posed a much higher oil spill risk than drilling and producing locally. For purposes of this analysis, it will be assumed that during the 25-year period, 7.373 billion barrels of oil will be imported through Los Angeles harbor. California onshore production will contribute 2.6 billion barrels. California state tidelands will contribute 720 million barrels. Existing Federal OCS leases in Southern California will contribute 788 million barrels and Sale 68 leases will contribute 123 million barrels (assuming that the full amount of projected oil is found and produced).

The probability of oil spill occurrence is based on the fundamental assumption that realistic estimates of future spill frequencies can be based on past OCS experience. This analysis assumes that spills occur independently of each other as a Poisson process, and that the spill rate is dependent upon the volume of oil produced or transported. This report examines, where the data permit, spills in 3 size ranges: 10,000 barrels or greater, 1,000 barrels or greater (which includes the first category) and between 50 and 1,000 barrels. To place these sizes in a rough perspective to the type of accident usually involved, spills in the largest category are usually associated with catastrophies such as large blowouts or shipwrecks. Accidents in the second category typically include these and other serious events, such as structural failures and collisions. Most accidents in the smallest size category involve occurrences such as valve failures and storage tank leaks.

The choice of which size range to use depends upon the analysis being performed. If, for example, a particular impact could occur only from a massive oil slick, then only large spills should be examined. Accident rates for platforms on the U.S. OCS were derived from USGS accident files (USGS, 1979), and from USGS production records (USGS, 1980). For spills 1,000 barrels or larger, the period from 1964 to 1979 was used. In 1970, reporting procedures were revised to improve the reliability of data for smaller spills, so the period from 1970 to 1979 was used for spills between 50 to 1,000 barrels. Between 1964 and 1979, there were 4 spills 10,000 barrels or larger, and 9 spills (including the 4) 1,000 barrels or larger. During this period, U.S. oil production was 4.386 billion barrels. There were 27 spills of 50 to 1,000 barrels between 1970 and 1979, when 3.205 billion barrels of oil were produced on the OCS. USGS accident files are also a major source of data for pipeline accidents. As with platforms, the period from 1964 to 1979 was used for spills of 1,000 barrels or larger, and 1970 to 1979 for spills between 50 and 1,000 barrels.
USGS accident files are also a major source of data for pipeline accidents. As with paltforms, the period from 1964 to 1979 was used for spills of 1,000 barrels or larger, and 1970 to 1979 for spills between 50 and 1,000 barrels.
USGS files (1979) include 2 spills over 10,000 barrels and 7 spills (including the 2) over 1,000 barrels. Devanney and Stewart (1976) report 5 additional pipeline spills, but all except 1 (of 1,020 barrels) occurred in coastal

channels. Adding this one spill to the USGS data gives a total of 8 spills 1,000 barrels or larger. From 1970 to 1979, the USGS files (1979) report 11 spills between 50 and 1,000 barrels.

Since nearly all U.S. OCS production has been transported to shore by pipelines, the same production statistics used for platforms can be applied to the pipeline accident data. Accident data and oil transportation data for tankers is not maintained by the USGS, so tanker accident rates must be derived from published literature. The tanker accident rate for spills of 1,000 barrels or larger, used in recent oil spill trajectory models, is from Stewart (1976): 178 spills in 45.941 billion barrels of oil transported. There is no detailed listing of these spills in the published literature. However, Devanney and Stewart (1974), examining tanker spills on major trade routes, reported 99 spills greater than 42,000 gallons (1,000 barrels), 87 spills greater than 100,000 gallons, and 32 spills greater than 1,000,000 gallons.

Interpolation of this data gives about 53 spills greater than 10,000 barrels, or about 54 percent of the 1,000 barrel spill rate. This estimate can be partially confirmed by listings of spills in Oil Spill Intelligence Report (1978 and 1979) where out of 22 spills of crude oil from bulk carriers, reported for 1978 and 1979, and known or estimated to be larger than 1,000 barrels, 15, or 68 percent, were larger than 10,000 barrels. Therefore, a factor of 60 percent of the 1,000 barrel rate appears reasonable, giving an estimated spill rate for 10,000 barrel and larger spills of 107 per 45.941 million barrels. Published data for tanker accidents does not permit an estimate to be made for tanker spills of 50 to 1,000 barrels, since reported rates typically include accidents in port and other events which are not covered in this analysis. A comparison with platform and pipeline rates suggests a rate in the range of 10 to 20 spills per billion barrels, but this was not considered sufficiently accurate to use in the calculations which follow. In summary, the spill rates used in this report are:

	Spills per billion barrels		
	50-1,000 bbl	1,000+ bbl	10,000+ bbl
Platforms	8.42	2.05	0.91
Pipelines	3.43	1.82	0.46
Tankers	n/a	3.87	2.32

Spill frequency estimates were calculated for production and transportation of oil imported from other areas by tankers within the study area. The assumption was made that only one-half the spills from tanker transportation of imported oil occur within the study area and that the other half of the spills occur outside the study area.

Oil Spill Model Results. The overall spill predictions based on the preceding information are as follows:

	Expected number of spills (mean)		Most likely number of spills (mode)		Probability of one or more spills	
	>1,000	>10,000	>1,000	>10,000	>1,000	>10,000
Existing leases plus imports	22.3	11.5	22	11	0.99+	0.99+
Sale 68	1.1	0.5	1	0	0.67	0.39
Sale 68 plus existing leases and imports	23.2	11.8	23	11	0.99+	0.99+

A more detailed breakdown showing projected oil spil impacts on the shoreline segments is shown in Tables IV.A.1.a-1 and IV.A.1.a-2. A detailed breakdown showing projected oil spill impacts on the targets is shown in Tables IV.A.1.a-3 and IV.A.1.a-4.

Conclusions. There is an existing high probability of an oil spill impacting Southern California resources due to the high level of imported oil required to support existing refineries. This includes some existing offshore activity due to previous leases and wells within the State of California 3-mile boundary. The oil spill model indicates that Lease Sale No. 68 could represent a 4 percent increase in spill potential; that is, increase the most likely number of spills from 22 to 23.

b. Cleanup and Containment: The prevention and mitigation of oil spills has historically been a prime consideration in OCS resource management. Prevention and mitigation measures are identified and required by OCS Order Nos. 2, 5, 7 and 8. The cleanup and containment requirements contained within OCS Order No. 7 have resulted in at least one oil skimmer, 1,500 feet of oil containment boom, dispersants, sorbant materials and other gear being required at every OCS site where any type of drilling or production activity is taking place. These requirements could be increased if special circumstances required it, however, it has not been judged necessary so far with the backup capability of the cleanup cooperatives nearby. Contingency plans for responding to spills and training are also part of the requirements. As a backup to the onsite equipment, there are three principal oil spill cooperatives in the Southern California area. These are Clean Coastal Waters located in the Long Beach Harbor, the Southern California-Petroleum Contingency Organization (SC-PCO) also located in the Long Beach Harbor and Clean Seas located at Santa Barbara. Each of these Co-ops has also deployed equipment at various strategic locations resulting in over 37 different oil spill skimmers of different types and 25 miles of boom, which is in addition to that which is deployed at the various offshore locations. If this equipment does not prove adequate, each co-op can quickly bring in equipment from various manufacturers and other locations throughout the country.

TABLE IV.A.1.a-1

PROBABILITIES (EXPRESSED IN PERCENT CHANCE) OF ONE OR MORE SPILLS, THE MOST LIKELY NUMBER OF SPILLS, AND THE EXPECTED NUMBER OF SPILLS OCCURRING AND CONTACTING LAND SEGMENTS OVER THE PRODUCTION LIFE OF THE LEASE AREA, SPILLS 1000 BARRELS AND LARGER

Land Segment	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
21	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
22	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0
23	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
24	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	7	0	0.1
25	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	n	0	0.0	7	0	0.1
26	n	0	0.0	9	0	0.1	n	0	0.0	15	0	0.2	n	0	0.0	21	0	0.2
27	n	0	0.0	7	0	0.1	n	0	0.0	10	0	0.1	n	0	0.0	12	0	0.1
28	n	0	0.0	7	0	0.1	n	0	0.0	16	0	0.2	n	0	0.0	19	0	0.2
29	n	0	0.0	3	0	0.0	n	0	0.0	7	0	0.1	n	0	0.0	8	0	0.1
30	1	0	0.0	42	0	0.5	3	0	0.0	58	0	0.9	4	0	0.0	61	0	0.9
31	3	0	0.0	27	0	0.3	4	0	0.0	39	0	0.5	5	0	0.0	43	0	0.6
32	n	0	0.0	1	0	0.0	n	0	0.0	4	0	0.0	1	0	0.0	5	0	0.1
33	n	0	0.0	2	0	0.0	1	0	0.0	4	0	0.0	1	0	0.0	6	0	0.1
34	1	0	0.0	3	0	0.0	1	0	0.0	7	0	0.1	1	0	0.0	11	0	0.1
35	2	0	0.0	91	2	2.5	2	0	0.0	92	2	2.5	2	0	0.0	92	2	2.5
36	2	0	0.0	6	0	0.1	3	0	0.0	10	0	0.1	3	0	0.0	11	0	0.1
37	1	0	0.0	1	0	0.0	3	0	0.0	13	0	0.1	3	0	0.0	15	0	0.2
38	n	0	0.0	n	0	0.0	3	0	0.0	16	0	0.2	4	0	0.0	22	0	0.3
39	n	0	0.0	n	0	0.0	1	0	0.0	6	0	0.1	2	0	0.0	13	0	0.1
40	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	9	0	0.1
41	n	0	0.0	17	0	0.2	1	0	0.0	36	0	0.4	1	0	0.0	41	0	0.5
42	n	0	0.0	2	0	0.0	n	0	0.0	4	0	0.0	n	0	0.0	6	0	0.1

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown.

TABLE IV.A.1.a-1 (Cont.)

Land Segment	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
43	n	0	0.0	16	0	0.2	1	0	0.0	34	0	0.4	2	0	0.0	41	0	0.5
44	n	0	0.0	n	0	0.0	1	0	0.0	4	0	0.0	1	0	0.0	8	0	0.1
45	2	0	0.0	45	0	0.6	4	0	0.0	70	1	1.2	5	0	0.1	75	1	1.4
46	n	0	0.0	n	0	0.0	n	0	0.0	4	0	0.0	1	0	0.0	6	0	0.1
47	2	0	0.0	35	0	0.4	4	0	0.0	52	0	0.7	5	0	0.0	56	0	0.8
48	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	2	0	0.0	13	0	0.1
49	n	0	0.0	1	0	0.0	2	0	0.0	3	0	0.0	3	0	0.0	14	0	0.2
50	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	4	0	0.0
51	1	0	0.0	1	0	0.0	2	0	0.0	6	0	0.1	4	0	0.0	14	0	0.2
52	4	0	0.0	17	0	0.2	8	0	0.1	36	0	0.4	10	0	0.1	42	0	0.5
53	1	0	0.0	1	0	0.0	2	0	0.0	4	0	0.0	3	0	0.0	8	0	0.1
54	n	0	0.0	n	0	0.0	2	0	0.0	3	0	0.0	3	0	0.0	7	0	0.1
55	1	0	0.0	1	0	0.0	3	0	0.0	3	0	0.0	5	0	0.1	15	0	0.2
56	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	4	0	0.0	15	0	0.2

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown.

TABLE IV.A.1.a-2

PROBABILITIES (EXPRESSED IN PERCENT CHANCE) OF ONE OR MORE SPILLS, THE MOST LIKELY NUMBER OF SPILLS, AND THE EXPECTED NUMBER OF SPILLS OCCURRING AND CONTACTING LAND SEGMENTS OVER THE PRODUCTION LIFE OF THE LEASE AREA, SPILLS 10,000 BARRELS AND LARGER

Land Segment	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
22	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
24	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0
25	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	n	0	0.0	3	0	0.0
26	n	0	0.0	3	0	0.0	n	0	0.0	5	0	0.0	n	0	0.0	8	0	0.1
27	n	0	0.0	2	0	0.0	n	0	0.0	3	0	0.0	n	0	0.0	4	0	0.0
28	n	0	0.0	3	0	0.0	n	0	0.0	8	0	0.1	n	0	0.0	9	0	0.1
29	n	0	0.0	1	0	0.0	n	0	0.0	3	0	0.0	n	0	0.0	3	0	0.0
30	1	0	0.0	18	0	0.2	1	0	0.0	29	0	0.3	1	0	0.0	31	0	0.4
31	1	0	0.0	11	0	0.1	1	0	0.0	17	0	0.2	2	0	0.0	20	0	0.2
32	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	3	0	0.0
33	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	3	0	0.0
34	n	0	0.0	1	0	0.0	n	0	0.0	4	0	0.0	1	0	0.0	6	0	0.1
35	1	0	0.0	58	0	0.9	1	0	0.0	59	0	0.9	1	0	0.0	59	0	0.9
36	1	0	0.0	2	0	0.0	1	0	0.0	5	0	0.0	1	0	0.0	5	0	0.0
37	n	0	0.0	n	0	0.0	1	0	0.0	6	0	0.1	1	0	0.0	7	0	0.1
38	n	0	0.0	n	0	0.0	1	0	0.0	8	0	0.1	2	0	0.0	12	0	0.1
39	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	7	0	0.1
40	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	5	0	0.0
41	n	0	0.0	9	0	0.1	n	0	0.0	19	0	0.2	n	0	0.0	22	0	0.3
42	n	0	0.0	1	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	3	0	0.0
43	n	0	0.0	9	0	0.1	n	0	0.0	19	0	0.2	1	0	0.0	23	0	0.3
44	n	0	0.0	n	0	0.0	n	0	0.0	3	0	0.0	1	0	0.0	4	0	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown.

TABLE IV.A.1.a-2 (Cont.)

Land Segment	--------- Within 3 days --------						-------- Within 10 days --------						--------Within 30 days ---------					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
45	1	0	0.0	27	0	0.3	2	0	0.0	44	0	0.6	2	0	0.0	49	0	0.7
46	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	n	0	0.0	3	0	0.0
47	1	0	0.0	20	0	0.2	1	0	0.0	31	0	0.4	2	0	0.0	34	0	0.4
48	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	7	0	0.1
49	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	8	0	0.1
50	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0
51	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	2	0	0.0	8	0	0.1
52	3	0	0.0	10	0	0.1	4	0	0.0	22	0	0.2	5	0	0.1	25	0	0.3
53	1	0	0.0	1	0	0.0	1	0	0.0	3	0	0.0	2	0	0.0	4	0	0.0
54	n	0	0.0	n	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	4	0	0.0
55	n	0	0.0	n	0	0.0	2	0	0.0	2	0	0.0	3	0	0.0	8	0	0.1
56	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0	2	0	0.0	8	0	0.1

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than a 0.5 percent probability of one or more contacts within 30 days are not shown.

TABLE IV.A.1.a-3

PROBABILITIES (EXPRESSED IN PERCENT CHANCE) OF ONE OR MORE SPILLS, THE MOST LIKELY NUMBER OF SPILLS, AND THE EXPECTED NUMBER OF SPILLS OCCURRING AND CONTACTING TARGET OVER THE PRODUCTION LIFE OF THE LEASE AREA, SPILLS 1000 BARRELS AND LARGER

Target	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Farallon Islands	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
San Francisco	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Anacapa Island	4	0	0.0	65	1	1.1	7	0	0.1	75	1	1.4	8	0	0.1	78	1	1.5
Point Loma	n	0	0.0	n	0	0.0	1	0	0.0	4	0	0.0	3	0	0.0	13	0	0.1
Dana Point	1	0	0.0	4	0	0.0	2	0	0.0	9	0	0.1	2	0	0.0	10	0	0.1
Long Beach	5	0	0.1	93	2	2.7	5	0	0.1	93	2	2.7	5	0	0.1	93	2	2.7
Tanner Bank	4	0	0.0	4	0	0.0	5	0	0.1	7	0	0.1	7	0	0.1	35	0	0.4
Cortez Bank	1	0	0.0	1	0	0.0	1	0	0.0	5	0	0.1	3	0	0.0	43	0	0.6

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

TABLE IV.A.1.a-4

PROBABILITIES (EXPRESSED IN PERCENT CHANCE) OF ONE OR MORE SPILLS, THE MOST LIKELY NUMBER OF SPILLS, AND THE EXPECTED NUMBER OF SPILLS OCCURRING AND CONNG TARGETS OVER THE PRODUCTION LIFE OF THE LEASE AREA, SPILLS 10,000 BARRELS OR LARGER

Target	Within 3 days						Within 10 days						Within 30 days					
	Proposed			Existing and Proposed			Proposed			Existing and Proposed			Proposed			Existing and Proposed		
	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean	Prob	Mode	Mean
Farallon Islands	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	1	0	0.0
San Francisco	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0	n	0	0.0
Anacapa Island	1	0	0.0	42	0	0.6	3	0	0.0	51	0	0.7	3	0	0.0	54	0	0.8
Point Loma	n	0	0.0	n	0	0.0	n	0	0.0	2	0	0.0	1	0	0.0	7	0	0.1
Dana Point	n	0	0.0	2	0	0.0	1	0	0.0	4	0	0.0	1	0	0.0	4	0	0.0
Long Beach	2	0	0.0	63	0	1.0	2	0	0.0	63	0	1.0	2	0	0.0	63	1	1.0
Tanner Bank	2	0	0.0	3	0	0.0	3	0	0.0	4	0	0.0	4	0	0.0	19	0	0.2
Cortez Bank	n	0	0.0	n	0	0.0	1	0	0.0	3	0	0.0	1	0	0.0	25	0	0.3

Note: n = less than 0.5 percent; ** = greater than 99.5 percent.

There is presently more oil spill equipment available along the California coast than could readily be used on even a major oil spill. Assessing the effectiveness of cleanup, in the case of a major oil spill, is difficult. This is because a large spill has not occurred in Southern California since the 1969 Santa Barbara blowout when most of the present equipment and techniques were not available. Also, meteorological and oceanographic conditions at the time of a spill cannot be predicted in advance. It would appear that in case of a major spill, equipment availability would not be the limiting factor governing cleanup, but more probably the weather conditions, sea state and any unusual factors. Captain Charles R. Corbett of the U.S. Coast Guard recently testified before the House Subcommittee on Oceanography concerning oil spill containment and cleanup capability. He stated that the "state-of-the-art" in technological development of containment and recovery equipment "has proceeded to the point where it is realistic to expect successful operation of open ocean recovery equipment in 8 to 10-foot seas and in winds of at least 20 knots." Sea state conditions in the Southern California Bight rarely exceed these conditions. New equipment is constantly being evaluated by the oil companies and co-operatives and purchased if they feel that it will enhance recovery.

The type of oil makes a difference in its characteristics and there is a wide variety of types in even the Southern California offshore oils. Past experience and current data indicate that on the average, within the first 12 to 24 hours, 50 percent of any crude oil spilled on the ocean will have disappeared either through evaporation or dissolving in the water column and possibly sinking. If mechanical recovery is not possible or feasible, several dispersants are currently available. They are stockpiled and can be authorized for use by EPA.

The wide variety of cleanup equipment available, oil types, weather conditions, location and amount of oil that could be released make generalized discussions of oil spill containment and cleanup difficult. For this reason, any discussion of effects or impacts are made in association with the particular resource that might be impacted. If a sale is authorized and drilling proceeds, a detailed contingency plan of response measures and mitigation will be required before any drilling takes place.

c. **Effects on Marine Life:** Petroleum hydrocarbons may have short-term acute lethal and long-term chronic sublethal effects on marine organisms. The short-term, acute effects are those usually associated with accidental oil spills while the long-term chronic effects which are less investigated, are expected to be more closely linked with the natural phenomenon of oil seeps, the slow dissolution of sediment trapped oil spill residues or large volume municipal-industrial effluent discharges. The acute effects are generally measured in the laboratory by 96-hour (or shorter) bioassays. A large volume of literature exists concerning these experiments and effects, usually death, have been recorded for a wide variety of marine organisms from unicellular algae to vertebrates exposed to both crude petroleum hydrocarbons and refined components. Results of these short-term studies must be interpreted with some caution when attempting to predict the effects on marine organisms outside the laboratory environment. Many factors such as temperature, wave conditions, sediment adsorption, etc., affect the behavior of oil spilled in the ocean. These combine with biological factors such as age, reproductive maturity and physiological stress from nonpetroleum pollutants and affect individual organisms' response to petroleum in the natural environment. The literature dealing with the long-term sublethal chronic effects on marine organisms is much less voluminous. The problems associated with maintaining organisms in long-term laboratory bioassays and monitoring a wide spectrum of possible effects other than death have kept the amount of information from which to predict long-term natural effects sparse. These long-term sublethal effects of chronic exposure to low levels of petroleum hydrocarbons are less dramatic than the death response to short-term, high-doses. However, in relation to population dynamics, and possibly the evolution of marine life, these effects may prove to be much more important. The reader should keep these caveats in mind when reading the effects given below. The responses of marine organisms to oil are discussed by group and no attempt has been made to cite all the effects literature for any one group. Acute toxicities are given in Table IV.A.1.c-1, modified from Craddock (1977).

Bacteria. Some motile bacteria, important in utilizing dead organic material and recycling nutrients, have been shown to respond to petroleum by reduced or blocked chemoreception. Mitchell, Fogel and Chet (1972) found bacterial response to chemical attractants was reversibly inhibited by 6,000 ppm phenol, toluene or Kuwait crude oil. Motility was not inhibited but was random. Walsh and Mitchell (1973) reported that Pseudomonas sp. was inhibited 50 percent in chemotactic response by Kuwait crude (10 ppm), kerosene (12 ppm), benzene (0.1 ppm) and phenol (120 ppm). Behavioral effects such as the above could cause a reduction in nutrient recycling and the ability of the ocean to purify itself without being reflected in bacterial plate counts used as routine monitoring tools.

Algae. Reduced CO_2 exchange rates and a toxic effect on photosynthesis in Fucus vesiculosus, Laminaria digitata, Porphyra umbilicalis and Enteromorpha sp. were found after submerged fronds were coated with thin films of crude oil (Schramm, 1972). Clendenning and North (1959) demonstrated 50 percent reduction in photosynthesis in fronds of Macrocystis pyrifera exposed to cresols and phenols (5-10 ppm) and dispersed diesel oil (10-100 ppm) for 4 days. Fronds

TABLE IV.A.1.c-1

ACUTE TOXICITY OF PETROLEUM TO SELECTED MARINE ORGANISMS

Organism	Petroleum Tested	Test Parameter	Concentration (ppm)
Coelenterata			
Tubularia crocea	Crude Oil WSF	Satic Bioassay 24 hr.	5,000 LC$_{50}$
Echinodermata			
Pisaster ochraceous (larval starfish)	No. 2 diesel fuel	Static Bioassay Gastrula stage 12 hr. avg. survival	5,000 ppm
Dendraster excentricus (larval sand dollar)	No. 2 diesel fuel	Static Bioassay Pluteus stage 21 hr. avg. survival	5,000 ppm
Mollusca			
Pacific Oyster *Crassostrea gigas*	Prudhoe Bay Crude	Static Bioassay 48 hr.	523 ppm
Mussel, Bay *Mytilus edulis*	Outboard motor effluent	Constant flow 24 hr.	1×10^5 ppm
Periwinkle *Littorina littorea*	Aramco Crude Oil	Simulated Tidal Cycle TD$_{50}$ 10 hr.	1.1×10^5
Limpet *Acmaea (Notoacmaea) scutum*	No. 2 diesel WSF	Static 48 hr.	22.1 (calculated)
Mussel *Mytilus californianus*	Santa Barbara Crude	Static 48 hr.	10,000

TABLE IV.A.1.c-1 (Cont.)

Organism	Petroleum Tested	Test Parameter	Concentration (ppm)
Annelida			
Neanthes arenaceodentata	No. 2 fuel oil	Static 96 hr.	2.7
	Bunker C	96 hr.	3.6
	S. Louisiana	96 hr.	12.5
	Kuwait Crude	96 hr.	>10.4
Capitella capitata	No. 2 fuel oil	Static 96 hr.	2.3
	Bunker C	96 hr.	0.9
	S. Louisiana	96 hr.	12.0
	Kuwait Crude	96 hr.	>9.8
Arthropoda			
American Lobster			
Homarus americanus	Venezuelan Crude	Static 96 hr.	2-30
Dungeness Crab			
Cancer magister	No. 2 fuel oil	Flow through 96 hr.	4,778 ± 1,071 ppm
Kelp Crab			
Pugettia producta (larva)	No. 2 fuel	Static 96 hr.	10
	Kuwait Crude	96 hr.	500
	S. Louisiana	96 hr.	450
Anyphipod			
Orchestia traskiana	No. 2 fuel whole oil	12.2°C exposed in dish	LT$_{50}$ 152 min.
Shrimp			
Pandalus danae	Prudhoe Bay Crude WSF	Static 24 hr.	~4
	S. Louisiana Crude Oil	24 hr.	~2

TABLE IV.A.1.c-1 (Cont.)

Organism	Petroleum Tested	Test Parameter	Concentration (ppm)
Grass Shrimp *Palaemonetes pugio*	S. Louisiana Crude WSF	Static 48 hr.	<16.8
	Kuwait	48 hr.	<10.2
	No. 2 fuel	48 hr.	5.5
	Bunker C	48 hr.	3.43
Shore Crab *Hemigrapsus nudus*	No. 2 fuel 0.7 14°C	Static Whole Oil	LT_{50} 812 min.
Barnacle *Balanus crenatus*	Norman Wells Crude Oil	Static Bioassay 96 hr.	30-1,000 ppm
Vertebrates Shiner Perch *Cymatogaster aggregata*	No. 2 fuel	Flow through Bioassay 96 hr.	550 ± 80
	Kuwait Crude	96 hr. flow through	1,300 ± 260
Staghorn Sculpin *Leptocottus armatus*	Kuwait Crude	96 hr. flow through	5,600 ± 1400
Pacific Herring *Clupea pallasii*	No. 2 fuel	96 hr. flow through	20
Starry Flounder *Platichthys stellatus*	S. Louisiana Crude Oil	72 hr. flow through	1,400 ± 110
Sand Sole *Psettichthys melanostichus*	S. Louisiana Crude Oil	Static 6 day	10 ppm (100% mortality)
	No. 2 fuel	Static 4 day	50 ppm (20% mortality)
	Kuwait Crude	Static 5 day	10 ppm (50% mortality)

exposed to 10 ppm of benzene, toluene and n-hexane showed slight reductions in photosynthesis in benzene and 75 percent reduction in toluene-treated plants. The latter displayed "visible injuries." Experimental conditions described above provide some indication of what one might expect in short-term accidental spills where hydrocarbon concentrations might reach the levels tested. Lower concentrations similar to what might be expected in chronic oil seep areas, have been shown to actually enhance photosynthetic rates in one species of Costaria (0.007 ppm crude oil; Shiels, Goering and Hood, 1973).

Behavorial effects of water soluble fractions of light petroleum fractions (1:25 to 1:110) have been demonstrated in Fucus serratus and F. vesiculosus (Cook and Elvidge, 1951). These light petroleums attracted Fucus sperm in a manner similar to the chemical attractants excreted from Fucus eggs.

Steele (1977) has shown that Fucus edentatus zygotes exposed to No. 2 fuel oil in concentrations as low as 0.2 ppb failed to grow or germinate if the exposure was made prior to gamete release and fertilization. Growth was reduced by approximately one-half in zygotes exposed to 20 ppb No. 2 fuel oil or 200 ppm crude oil after gamete release and fertilization. Low levels of petroleum hydrocarbons may stimulate growth in some photoplankton (Galtsoff et al., 1935; Prouse, Gordon and Keizer, 1976). These latter authors suggest that growth of phytoplankton can be stimulated by petroleum at levels less than 0.1 ppm and inhibited at levels above that. It is clear from these and other experiments that the growth response depends upon the species of algae (different species in the same genus may exhibit different tolerances and/or responses at the same levels of petroleum) and the types of hydrocarbons (low and high boiling fractions of crude may affect algae differently). Finally, Boney (1974) found that some aromatics, including 3, 4 benzpyrene, a known carcinogen, caused "cancerous" growths in Antithamnion plumula at 0.3 to 3 ppm.

Coelenterates. Many corals have shown reduced feeding behavior and reduced tentacular contraction activity when exposed to crude oil (Lewis, 1971; Reimer, 1975a) and the internal symbiotic zooxanthellae of some corals may be extruded by exposure to oil (Reimer, 1975b; Birkelund, Reimer and Young, 1976). The anemone, Anthopleura elegantissima, found commonly in the California intertidal zone, retained its chemoreceptive alarm behavior when exposed to 0.1 to 0.2 ppm water-soluble fraction of Prudhoe Bay crude oil. During the two-week test, experimental animals attempted to withdraw from the test chambers while control animals did not (Hanson, NOAA, NMFS, Northwest and Alaska Fisheries Center, Seattle, Washington, unpublished results). Birkelund, Reimer and Young (1976) recorded reduced growth over a 61-day period in the coral Porites furcata after exposure for 1 and 2½ hours to Bunker C fuel oil.

Annelids. Some species of adult polychaetes seem quite resistent to oil in their environments while showing relatively high sensitivity to oil in acute exposure bioassays. Capitella capitata has been found in abundance in petroleum-affected sediments while showing sensitivity in laboratory exposures to water-soluble fractions of crude oil in the low ppm range (George, 1971; Rossi, Anderson and Ward, 1976). Chia (1973) observed loss of movement and sinking of trochophore larvae of Nereis brandti and Serpula vermicularis exposed to No. 2 diesel oil.

Carr and Reish (1977) found that narcosis usually preceded death in five species of annelids exposed chronically to No. 2 fuel oil and South Louisiana crude oil.

Studies of the cirratulid polychaetes, *Cirriformia tentaculata* and *Cirratulus cirratus*, species common in California rocky intertidal habitats, demonstrated that the field populations were relatively unaffected by oiled sediments as measured by spawning, growth and mortality (George, 1971). Akesson (1975), however, noted growth reductions up to 85 percent of normal in bioassays of the eunicid polychaete *Ophryotrocha labronica* and Carr and Reish (1977) noted decreases in the number of offspring in that species and in *Ctenodrilus serratus* at low (1.3 ppm No. 2 fuel oil) hydrocarbon concentrations.

Arthropods. The effects of petroleum on arthropods have been reported in a large number of research papers. In addition to the various factors affecting the response of other groups of marine invertebrates, the arthropods have an added confounding factor. The phenomenon of molting may change the rates of uptake and tolerance to hydrocarbons depending on whether the animals are pre, post or in the midst of molting and may itself be influenced by the exposure to petroleum. Serious consequences to the life history of the animal may occur since the molting stage is considered a very vulnerable stage in the life cycle.

The physiological effects of petroleum hydrocarbon on crustacea are documented in a number of species, but are unpredictable, (Anderson, Neff and Petrocelli, 1974; Anderson, 1975; Tatem, 1976; Rice et al., 1976). Osmoregulation, the control of body fluids and salts, may be disrupted by the water-soluble fraction of crude oil (Anderson, Neff and Petrocelli, 1974). Karinen and Rice (1974) found that Tanner crabs exposed to Prudhoe Bay crude oil autotomized (lost) their limbs shortly after or during molting.

Narcotic effects have been noted for arthropods in general. Crisp, Christie and Ghobashy (1967) found reduced cirral activity in barnacle larvae exposed to petroleum hydrocarbons. Narcosis has been shown in planktonic larval lobsters exposed to 0.1 ppm water-soluble fraction of crude oil (Donahue et al., 1977), in larval spot shrimp and Dungeness crab (Sanborn and Malins, 1977) at 8 to 12 ppb naphthalene, and grass shrimp (Tatem, 1976). Phototactic behavior was significantly changed in larvae of the rock crab, *Cancer irroratus* when exposed to No. 2 fuel oil (Bigford, 1977) at concentrations of 1.0 and 0.1 ppm. Ingestion of oil has been documented by Conover (1971) for planktonic copepods in Chedabucto Bay following the spill from the tanker Arrow and by Blackman (1972) for laboratory brown shrimp *Crangon crangon*. Blumer et al., (1973) found that chemoreception-mediated behavior was disrupted in the American lobster exposed to oil but could not detect any morphological changes in the odor receptors. Minichev and Brown (1979) found eye lesions in the brown shrimp *Penaeus aztecus* and suggested a link to sediment-bound residual crude oil.

Marine arthropods exhibit such diverse growth responses to petroleum hydrocarbon that generalizations are impossible. Growth was not affected by No. 2 fuel oil in the brown shrimp but significantly reduced growth in grass shrimp (Cox and Anderson, 1973). Reproduction, as measured by hatching rate, has been shown to be reduced in grass shrimp exposed to No. 2 fuel oil for 72 hours (Tatem, 1976). Straughan (1971), on the other hand, found no indications of breeding effects by oil in two high-intertidal sessile barnacles, Balanus glandula and Chthamalus fissus, while Pollicipes polymerus was affected by oil in the intertidal. The settlement of larvae of the above species was apparently retarded on oiled substrates.

Molluscs. Behavioral effects of exposure to petroleum hydrocarbons have been investigated in gastropods where narcotization seems to be a general response. Specific effects include inability to maintain attachment to the substrate by the limpet Patella vulgata (Dicks, 1973), loss of response to tactile stimulation in the snail Thais lamellosa (Ehrsam, et al., 1972), increased crawling rate in the snail Littorina littorea (Hargrave and Newcombe, 1973) and loss of chemoreception ability in the snails Nassarius obsoletus (Jacobson and Boylan, 1973) and Urosalpinx cinerea (Blake, 1960). Impairment of byssal thread production in the mussel Mytilus edulis was noted in animals exposed to less than 350 ppm crude oil (Swedmark, Granmo and Kollberg, 1973). Reductions in metabolism due to oil (Gilfillan, 1975) in Mytilus edulis may affect subsequent spawning success as also indicated by reduced breeding in Mytilus californianus following the Santa Barbara oil spill in 1969 (Straughan, 1971).

Growth of bivalve molluscs may be affected by the presence of crude oil, but it appears to occur only at high concentrations of hydrocarbons. Anderson (1975) found no indication of reduction of growth after 105 days in the oyster Crassostrea virginica exposed to 1 percent oil-seawater dispersion for 96 hours. In field studies growth was found to be reduced near oil field bleed-water discharge in oysters less than 150 feet from the discharge point. The clam Mya arenaria experienced reduced growth in intertidal sediments contaminated with oil as compared to adjacent uncontaminated sediments (Dow, 1975). Abnormal development of oyster larvae was observed by Legore (1974) in Crassostrea gigas at 1,000 ppm Alaskan crude oil. Threshold doses for inducement of abnormalities by benzene, toluene and xylenes were 3.1 to 3.6 ppm. Renzoni (1973, 1975) demonstrated that bivalve sperm and fertilization could be adversely affected by water-soluble fractions of various crude oils in 1 to 1,000 ppm concentrations.

Echinoderms. Very little work has been done on the effects of petroleum hydrocarbons on echinoderms. Whittle and Blumer (1970) have demonstrated that oil can reduce chemoreceptive-based feeding behavior in the starfish Asterias vulgaris. Crude oil has also been shown to produce developmental abnormalities in sea urchins, although there appears to be no significant reduction in fertilization success (Lonning and Hagstrom, 1975).

Vertebrates-Fish. Fish exposed to petroleum hydrocarbons exhibit two types of behavioral responses: an avoidance reaction and a cough reaction. Several marine species showed avoidance reactions to crude oil at 0.7 ppm (Syazuki, 1964). Larvae of some species (Atlantic cod, Atlantic herring and plaice) did not seem able to avoid oil-contaminated water (Kuhnhold, 1970). The cough response which probably indicates an irritation reaction to petroleum hydrocarbons has been found in salmon fry exposed to the water-soluble fraction of Prudhoe Bay crude oil, Cook Inlet crude oil and No. 2 fuel oil (Rice, Thomas and Short, 1977) at 0.35 to 2.22 ppm. The reaction seems to be temporary and probably correlated with the levels of aromatic compounds in the water which decrease with time.

Larvae of the winter flounder have shown narcotization response to Bunker C fuel (1,000 ppm) when exposed for 42 hr (James, 1926). Struhsaker et al. (1974) has reported that larvae of the Pacific herring exposed to 6.7 and 12.1 ppm benzene for 48 hours showed reduced levels of feeding and swimming which returned to normal in about five days.

Reproductive effects have been reported by Kuhnhold (1970) for the Atlantic cod. Eggs exposed to the water-soluble fraction of crude oils from Libya, Iran or Venezuela at concentrations of 10 ppm or less for 100 hours, then placed in clean seawater, showed increased mortality of eggs to the hatching stage with increasing concentration of oil. In addition, most of the larvae which survived were deformed. Similar results were observed in the Pacific herring and Northern anchovy at concentrations of 30 to 45 ppm benzene (Struhsaker et al., 1974). Smith and Cameron (1979) have demonstrated hatching failure in Pacific herring for water-soluble fractions of Prudhoe Bay crude oil at 1.0 ppm with accompanying morphological abnormalities in the embryos. Larvae of the herring exposed to ^{14}C-benzene accumulated this aromatic compound in direct proportion to the initial exposure concentration reaching a tissue equilibrium (6.9 times ambient initial concentration) after 6 to 12 hours. Uptake of benzene occurred initially through water and secondarily through the food source (Eldridge, Echeverria and Korn, 1978). Hedtke (1980) examined Jordanella floridae during various life cycle stages and reported that egg production per female was significantly reduced at levels of 3,380 ppm water-soluble fraction of oil.

Vertebrates-Birds. There are two general types of effects which birds may experience when exposed to petroleum hydrocarbons. The most obvious and generally the first effects to occur are those due to external oiling of birds in a spill. As the birds become oiled, air trapped between the feathers is eliminated and the bird may sink and drown if it is a sea bird. Slight contamination of the feathers may add substantially to a bird's weight (Holmes and Cronshaw, 1977) and affect the ability of flight feathers to form properly, thus affecting the bird's flying ability. A secondary effect of the loss of air from between feathers is a reduction in the insulating quality of the feathers. This is followed by an increase in metabolic rate as the bird attempts to maintain thermal equilibrium (Hartung, 1967).

The second mechanism of oil contamination affecting birds is internal. Experiments with ducks have shown that they may ingest up to 7 ml of oil per kg of body weight by pruning oil-contaminated plumage and may also ingest food which has been contaminated with oil (Hartung and Hunt, 1966). The effects hydrocarbons taken internally may have depends to a large extent on the life stage of the bird. As early as the 1930s, Gross suggested that spraying oil on herring gull eggs may be used to control populations of that bird. Hartung (1965) and Kopischke (1972) have shown that embryonic development is stopped when oil is sprayed over eggs due to the impaired gas exchange through the oiled egg shell. Recently, Albers (1978) and Szaro and Albers (1977) indicated that oil may exert teragenic effects internally in the shell.

The response of juvenile birds to ingestion of oil is through changes in intestinal transfer of fluids. Animals fed 5 percent crude oil showed little mortality, but significant mortality if the dose was increased to 10 percent. The principal cause of death appeared to be electrolyte imbalance with oil causing an impairment of secretion of adrenal hormone mediating the osmoregulatory mechanisms of the gut lining (Crocker and Holmes, 1976).

Adult Pekin ducks fed 3.0 and 2.4 ml of several crude oils per kg body weight were able to survive almost indefinitely on this diet, but when subjected to cold stress showed mortality levels of about 60 percent to 90 percent after 35 days of cold (5°C) (Holmes, Cronshaw and Gorsline, 1978). Ovarian dysfunction has also been demonstrated (W. N. Holmes, personal communication).

Vertebrates-Marine Mammals. Little data exists on the effects of oil on marine mammals. Difficulties in detecting and collecting mammals which may have been contaminated or in performing experiments upon marine mammals are encountered. Mammal carcasses have been found coated with oil (Anon., 1970), but no data to date indicates clearly oil as the causative agent of death. Two laboratory studies have been done on ringed seals in order to more closely examine the effects of oil on marine mammals. The effects noted ranged from eye problems which cleared up three to four days after the exposure to death of three experimental animals within 71 minutes of immersion (Smith and Geraci, 1975; Geraci and Smith, 1976). Geraci (1972) has found liver damage in grey seals fed 5 to 10 ml of carbon tetrachloride. There is no indication of thermoregulatory problems in phocid seals, but these rely more on blubber for insulation than the otariid seals which rely heavily on the fur for thermal protection. Sea otters likewise might also suffer thermoregulatory problems since they are similar to the otariid seals in relying on fur for insulation.

The effects of oil on cetaceans is not known at this time. Reports of grey whales being affected by oil during the Santa Barbara oil spill in 1969 were not substantiated (Straughan, 1971), and since cetaceans are not shore dwelling as are the pinnipeds, it is unlikely that the degree of fouling the latter could experience would be probable. Thus, extrapolation to cetaceans from the small amount of experimental data on pinnipeds is difficult. The most likely effects to whales and porpoises would be eye irritation similar to that experienced by ring seals.

Ecosystem Effects. The extent of biological impacts or ecological losses are defined in this section for use throughout the EIS. Definitiona are as follows:

(1) Severe impact or ecological loss means that a species or assemblage has become extinct.

(2) High impact or ecological loss denotes a significant long-term interference with ecological relationships. This usually involves the mortality or a biological alteration of a noticeable segment of the population, community or assemblage.

The definition of "long-term" must be rather arbitrary in terms of a specific number of years. If a generation of a particular species is eliminated from an area and it requires several generations to build the population to its original level, then this should be considered a long-term impact. However, since the reproductive periods of the various species varies from weeks in certain invertebrates to many years in other organisms, a long-term impact will, in reality, last several months to many years. Long-term impacts, as used here, will be considered to be at least two years.

(3) Moderate impact or ecological loss is between the two extremes of impacts and must be somewhat subjective. A moderate ecological impact probably occurred on the rocky intertidal during the Santa Barbara oil spill of 1969. Although some areas experienced nearly complete mortality to several species, other species experienced low mortality. At other areas, mortality to all species affected was moderate.

(4) Low or small impact or ecological loss denotes an interference with ecological relationships, but the interference is not particularly significant to either the relationships or the species, community or assemblage, nor long lasting. Although the time interval again is somewhat arbitrary, as used here it will be considered less than a year.

2. Manmade Structures: Manmade structures are discussed in detail in the Final Environmental Statement for OCS Sale No. 48, in Oil and Gas Transportation Scenarios for Proposed Sale No. 68 (POCS Technical Paper No. 81-1), and as noted below.

a. Onshore: For the proposed sale, onshore manmade structure refers to shore and land facilities or structures that would be needed to support the proposed oil and gas operation. There could be a need for the following four types of facilities or structures: harbors for supply and crew boats, new support bases for pipeline construction, pipelines, and airports for helicopters. Existing harbors would be utilized; no new ones would be needed. The use of existing harbors could disturb normal onshore activities. The new support bases for pipeline construction could temporarily disturb normal onshore activities. Pipelines could cause environmental impact during construction. Helicopter activities should have no significant impact on the airports.

Crew and supply boats used (see Section IV.A.3) to service the proposed area could use the existing (including proposed) piers and harbors. To service the Santa Barbara Channel and Outer Bank areas crew boats could use the existing piers at Ellwood, Carpenteria, Port Hueneme, Port of Los Angeles, Port of Long Beach and the proposed Gaviota Supply Base. Supply boats could transport light equipment from the above piers and heavy equipment from Port Hueneme, Port of Los Angeles, Port of Long Beach and the proposed Gaviota Supply Base.

Crew boats would not have a significant impact on the operation of the above harbors. Supply boats could have impacts on the above harbors with respect to dock space utilization and manpower. Harbors would need facilities and manpower to handle and store incoming materials, such as powdered drilling mud and drilling cement, additives, drill pipes, transportation pipes, well casings, fuel, water, miscellaneous equipment, garbage, and waste drilling material (see FEIS Sale No. 53, Section IV.A.2).

New support bases would probably be needed only for a pull-type pipe-laying method (see Section IV.A.2.b). Four temporary operational support bases could be constructed near each of the following four proposed offshore pipeline routes (see Section I.B.1.c): West Side Santa Barbara Channel, near Point Conception; East Side Santa Barbara Channel, near Carpenteria; Anacapa-Santa Monica Basin, near El Segundo; and San Pedro, near Port of Long Beach and Huntington Beach. These support bases could be constructed to store pipes, equipment and other materials. Each of the above four support bases could occupy approximately 6 hectares (15 acres).

There could be approximately 3 km (2 miles) of buried onshore pipeline at El Segundo (see Section I.B.1.c). During construction, a 30.5-m (100-foot) wide pipeline right-of-way could be required. For operation and maintenance, a 15.2-m (50-foot) wide right-of-way could be adequate. Construction of onshore pipelines could cause air pollution (see Section IV.C.2) and disruption of normal traffic from construction equipments and employee vehicles.

Helicopter services would be needed to shuttle crews and lighter equipment from the airports to the drillships, pipelay barges and platforms; also helicopter services would be needed for inspections, emergencies and special situations. Helicopters could originate from the airports that are located near the proposed tract areas and are shown in Minivisual No. 1. Increased helicopter traffic should have no significant impact upon airways and local airports.

b. Offshore: Additional source of information for offshore manmade structures is in Sections I.B.1 and III.A.3, and as noted. For the proposed sale area, the following four types of offshore manmade structures are proposed: exploratory and delineation wells (drilled from exploratory rigs), production platforms, single-anchor leg-mooring (SALM) buoys and pipelines. During exploratory drilling, the anchors/chains of mobile rigs (drillships, jackups, and semisubmersibles) would disturb the sea bottom; and the location of mobile rigs could interfere with fishing and navigation. During development, construction of platforms and SALMs, and pipe-laying activities would disturb the sea bottom and interfere with fishing and navigation. During production, the location of platforms and SALMs could interfere with fishing and navigation. Disturbance of the sea bottom during above exploration and development could interfere with biological and cultural resources. The biological resources would include a minimal and shorter-term impact on soft bottoms and longer-term impact on hard bottoms. The cultural resources that could be impacted are aboriginal sites and historic shipwrecks. These offshore structures could cause oil spills (see Section IV.A.1) and emission of air pollutants (see Section IV.C.2).

Estimated numbers of structures are (see Section I.B.1): 150 exploratory and delineation wells, 8 production platforms, 4 SALMs and approximately 154 km (96 miles) of pipelines. Table IV.A.2.b-1 tabulated the chronological oil and gas offshore development in Southern California. The first offshore development in the United States began in 1896, off Southern California. All the development occurred in State water from 1896 to 1967, resulting in 9 platforms, 7 artificial islands and approximately 428 km (266 miles) of offshore pipelines. Development in Federal waters started in 1968 resulting in 16 platforms (10 existing and 6 proposed), one offshore SALM (single-anchor leg-mooring system) and used approximately 217 km (135 miles — 91 existing and 44 proposed) of offshore pipelines.

Exploratory and delineation wells are drilled from either drill ships, semi-submersibles, or, jack-up rigs. The semi-submersibles usually occupy the greatest area. Generally, the semi-submersible drilling rigs use 8 anchors which weigh about 18,141 Kgs (20 tons). Anchors could be placed at an approximate distance of 3 to 8 times the water depth of the well (FEIS Sale No. 48, III.A.3). Ocean Bounty, for example, measures approximately 81 x 107 m (266 x 352 feet) and has 8 - 18,141 Kgs (40,000 pounds) anchors (Ocean Drilling & Exploration Company, 1978). Work boats are used to place and recover anchors. There is serious potential for sea floor disruption, particularly in rocky bottom areas.

TABLE IV.A.2.b-1

HISTORY OF OIL AND GAS DEVELOPMENT OFF SOUTHERN CALIFORNIA

Year	Events
1896	First offshore oil production in the United States off Santa Barbara County
1927	Tideland discovery at Rincon
1929	Tideland discovery at Elwood
1930	Tideland discovery at Huntington Beach
1939	Tideland discovery at Long Beach
1953	Tideland discovery at West Montalvo Field
1954	Monterey artificial island
1955	Rincon artifical island
1960	Platforms Henry and Hilda
1961	Platform Harry (been disassembled)
1961	Sea floor completion wells - Rincon Island and Coal Oil Point
1962	Sea floor completion walls - Alegria and Gaviota
1963	Platforms Emmy and Herman
1964	Platform Eva
1965	Platform Hope and artifical island Esther
1966	Platforms Heidi and Holly
1967	Four artificial islands: Grissom, White, Chaffee and Freeman
1968	Platforms: A, B, Hogan and Houchen
1969	Platform Hillhouse
'74-'80	Platforms: C, Ellen, Elly, Grace and Hondo
1980	Proposed platforms: Edith, Eureka, Gilda, Gina and Habitat

References: USGS Report 80-645; Offshore Petroleum Resource, 1971, The Resource Agency of California

*Note: All entries prior to 1968 are in State waters. All entries from 1968 to present are in Federal waters.

A SALM facility occupies only a small space. However, with a vessel tied to a SALM mooring line, the vessel could swing or rotate in a circular fashion around the mooring site. The maximum swing distance for SALM (Hondo) with offshore storage and treatment facility and shuttle tanker is estimated at 601 m (1973 feet) (personal communication, W. Devine, March, 1981). The pipelines could be laid from a pipe lay-barge or pulled from shore by a barge (pull-method). For the pipe lay-barge method the pipelines would be stored at an existing harbor and transported by a supply boat to the bay-barge. Pipelines would be assembled and laid from the lay-barge. For the pull-method the pipelines would be stored and assembled at the new onshore support bases. Pipelines would be laid by having the barge pull the assembled pipelines from shore. Anchor placement for both pipe-lay methods is similar to above mobile drilling rig anchor placement. Lay-barge would use 8 anchors similar to that described above; pull-method, 4 anchors which weigh about 1/2 to 3/4 of lay-barge anchors. Both pipe-lay methods would disturb the sea bed and interfere with fishing and navigation. Unburied pipelines could interfere with trawl fishing; especially, unshrouded valves, taps and other irregular surfaces. Near shore, from water depth of 61 m (200 feet) to shore, the pipeline could be buried to a minimum of 0.91 m (3 feet) by the jet-sled trenches and the clamshell digger. The pipeline burial operation could bury about 42 m (26 miles) of pipelines and excavate approximately 14,500 cubic meters (19,000 cubic yards) of sea bottom.

3. Vessel Traffic

a. Barges: The sources of information for barges is reported in the Sale No. 68 Proposed Oil and Gas Transportation Scenarios (POCS Technical Paper No. 68-1).

Barges would continuously transport crude oil from the proposed sale areas to the refineries in the Los Angeles (LA) Basin. Barges to LA from the proposed sale areas are described below.

Increased use of barges would increase the vessel traffic accidents (IV.C.17). These barges could also cause oil spills (IV.A.1) and emissions of air pollutants (IV.C.2).

For Transportation Scenario No. 1 (a mixed mode of pipelines and barges) crude oil is transported by pipelines to shore from the Santa Barbara Channel and Inner Bank areas, and by barges to the Ports of Los Angeles (LA) and Long Beach (LB) from the Outer Bank area. Barging transportation is estimated as follows:

1) A 20,000-barrel barge would transport crude oil from the South Santa Rosa Island subarea to the refineries in LA and LB. Approximate turnaround time for the barge is 9.6 days, which totals 38 trips per year.

2) A 30,000-barrel barge would transport crude oil from the Dall Bank and San Nicholas subareas. The barge would first load crude at the Dall Bank subarea followed by loading at San Nicholas Basin and finally

unloading at the Ports of LA and LB. Approximate turnaround time for the barge is 3.4 days, which totals 107 trips per year.

3) A 30,000-barrel barge would transport crude from the S.E. Tanner Bank - Santos Tomas Knoll subarea to the refineries of LA and LB. Approximate turnaround time for the barge is 3.1 days, which totals 119 trips per year.

b. Supply and Crew Boats: The source of information for the supply and crew boats is reported in the Sale No. 68 Proposed Oil and Gas Transportation Scenarios (POCS Technical Paper No. 68-1). The most probable condition is indicated in Table I.B.1.b-1 and other referenced reports.

Supply and crew boats would continuously service the drill ships, pipe-lay barges and platforms. These boats could interfere with commercial vessels, commercial fishing boats, recreation boats and harbors.

The supply and crew boats would service the proposed sale areas from the nearest existing and assumed existing piers and harbors. It is estimated that these boats could service the proposed subareas as follows: West Side Santa Barbara Channel by 60 crew-boat and 9 supply boats trips per month from the proposed Gaviota Supply Base; East Side Santa Barbara Channel by 60 crew-boat trips per month from Carpenteria Pier and 9 supply-boat trips per month from Port Hueneme; Anacapa - Santa Monica Basin by 60 crew-boat and 9-supply boat trips per month from Port Hueneme; San Pedro by 60 crew-boat and 9-supply boat trips per month from Ports of Los Angeles and Long Beach; South Santa Rosa Island by 7 crew-boat and 9 supply-boat trips per month from Port Hueneme; Dalo Bank, San Nicholas Basin, S.E. Tanner Bank and Santo Tomas Knoll by 7 crew-boat and 9 supply-boat trips per month from each of the subareas to Ports of LA and LB.

4. Noise and Other Disturbances: Noise emissions resulting from OCS development are associated with the operation of offshore platforms, drilling rigs, petroleum transfer facilities, onshore processing plants, pump stations, helicopters, etc. In addition, construction equipment used during the installation of the various facilities emit various amounts of noise. The degree of noise impact depends upon the emitted sound level and the proximity of the source to a noise sensitive receptor such as a school, hospital, residence, etc. The precise location of the various facilities is not known at this time. Thus, site specific noise impacts cannot be evaluated here; however, they will be considered in a future EIS when development plans are known.

Machinery noise sources found on drilling and production platforms are, generally, similar to those used for shore-based operations. Special noise attenuation devices are sometimes used offshore to protect workers in their living quarters located on the platforms. Compressors and diesel electric engines are usually the loudest equipment on a typical platform emitting about 90 dBA at a distance of 15 m (50 feet). By comparison, a diesel truck under full load also emits about 90 dBA at 15 m. Although other sounds, such as banging of pipes and use of explosives may be more intense, they are of extremely short duration. The possible impact of Sale No. 68-related noise emissions on the biological environment is discussed in subsequent sections.

In a quiet sea with light wind conditions, normal offshore platform operations would be inaudible beyond about 2 miles (assuming ambient background noise level of 40 dBA and attenuation due to sound wave spreading only). In rough seas and weather conditions, the offshore facility would be inaudible beyond about 1/8 of a mile (assuming 70 dBA background). No onshore noise impact from normal operation of OCS platforms are expected since even under low background noise conditions they would not be audible from shore. Onshore noise levels could be slightly increased by Sale No. 68-related vessel, vehicle and helicopter traffic; however, these increases are generally expected to be small.

Most of the onshore processing and support facilities would necessarily be located in industrially zoned areas where noise would have a minimal impact. If adjacent sensitive receptors were impacted, mitigation measures such as sound barriers (i.e., earthen berms, block walls, etc.,) and mufflers could be utilized. The site specific noise impact of these developments will be considered in a future EIS when detailed development plans are known.

5. Effluents and Discharges

a. Water: As a result of the proposed sale, the development and operation of offshore oil- and gas-producing facilities will discharge materials that may potentially have an impact on the natural environment. Material that is discharged from offshore oil and gas operation will result from two types of activities: 1) the normal or routine activities that may occur day-to-day, and 2) the episodic or occasional massive emission events (e.g., oil spill) resulting from equipment failure, poor operation techniques or a variety of events. Materials that may be routinely discharged from oil and gas development and production are drilling cuttings and muds, formation water and treated sewage. Discharge of effluents from OCS activities is under the jurisdiction of the EPA through the National Pollution Discharge Elimination System permits.

Drill Cuttings and Muds. Once drilling starts, drill cuttings and drilling muds will be dumped into the marine environment. Daily discharge of cutting ranged from 0-28 m^3/day (0-176 bbl) and 10-20 bbls of drilling muds (ECOMAR, 1978) for a 3,419 m exploratory well.

The total amount of drill cuttings and drilling muds estimated to be discharged into the marine environment as a result of this sale and specific information for each area is given in Table IV.A.5.a-1.

It should be noted that the discharge figures given for drilling muds in Table IV.A.5.a-1 are liberal. During production phases of OCS operations, drilling muds are normally used in drilling several wells from the same platform. In the case of costly muds, the fluids may be transported to other platforms for use in drilling production wells (Dames and Moore, 1980 comments on DEIS for Sale No. 53).

A comprehensive discussion on the functions, disposal and composition of drilling muds in common use in the Southern California OCS are found in the Final EIS OCS Sale No. 53 and Sale No. 48.

Discharge of drilling mud must comply with requirements found under OCS Order No. 7 and the National Pollutant Discharge Elimination System (NPDES) permitting procedures. Both of these requirements restrict the discharge of any drilling mud containing oil. The U.S. Geological Survey, Conservation Division, states if any oil base mud is used, the mud would not be released to the ocean, and cuttings would be cleaned or barged to shore for disposal. Currently, the only mud components used to make up drilling mud that must be registered with the Environmental Protection Agency are bacteriacides (CFR 40,162.26).

Discharge of Formation Water. Formation water or oil field brine is recovered along with oil during petroleum production. The formation water is derived from water that was laid down interstitially with the sediments in the geological past. During the compaction, some of this interstitial water (connate water) was displaced from the resulting formation to form formation water. Consequently, formation waters reflect their environment of deposition.

TABLE IV.A.5.a-1

ESTIMATED TOTAL AMOUNT OF DRILLING FLUID AND WASTE

Area	Drill Cuttings (000 BBLS)	Drilling Muds (000 BBLS)	Formation Water (Mil. BBL)	Sewage (Gal/Day)
Santa Barbara Channel	183	117	67	7,600
Inner Banks and Basins	65	35	70	7,600
Outer Banks and Basins	146	68	93	15,200
TOTAL	394	220	230	30,400

After separating oil from formation water, the formation water may be disposed of by injecting into disposal wells, reinjecting into producing wells, discharging into the marine environment, or a combination of these three disposal methods. Traditionally, Southern California OCS formation waters have been discharged into the marine environment.

Under EPA effluent limitations (CFR, 1975), "...the design of formation and other wastewater disposal systems will limit the oil content of discharged effluent to a maximum of 72 mg/l for any one day, and a 30-consecutive-day average not to exceed 48 mg/l..." During initial oil production, formation water volumes will represent a very small fraction of total fluid extracted from the well, with oil composing almost the total amount of fluid. As the oil reservoir is depleted, the ratio of formation water to total extractable fluid increases.

Formation water volume estimates are shown for the three general sale areas in Table IV.A.5.a-1. Over the first 20 years of production, a total of 220 million barrels of formation water are expected to be discharged within the proposed sale areas.

The reader will find a more detailed discussion of the composition of typical Southern California formation waters given in the Final EIS for OCS Sale No. 53 and Sale No. 48.

Sewage. The estimated annual discharge of sewage from proposed oil and gas activity is shown in Table IV.A.5.a-1. OCS Order No. 8 states "following sewage treatment, the effluent shall contain 50 ppm, or less, of suspended solids, and shall have a minimum chlorine residual of 1.0 mg/liter after a minimum retention time of 15 minutes. The daily volume of sewage that will be discharged within each of the proposed areas will range from 7,600 gallons/day to 15,200 gallons/day. Sewage discharge was estimated as 100 gal/day/person on the platform.

Hydrocarbon Discharges. Hydrocarbons may be discharged into the marine environment as a result of accidental spills from episodic or occasional massive emission events. The volume of oil which enters the marine environment will depend on the type of accident and is very difficult to predict. Once the oil enters the ocean a variety of physical and chemical processes act to disperse the oil slick including spreading, evaporation of the volatile constituents, dissolution into the water column, emulsification of small droplets, agglomeration and sinking, microbial modification, photochemical modification and biological ingestion and excretion. The rates at which the oil is removed from the ocean will depend on water temperature, current movements which may spread dissolution, wind speed which may aid evaporation and physical mixing by wind waves. A more complete discussion of these factors is found in Malins (1977) and Wolfe (1977).

In addition to the larger spills from rare accidents, some oil is expected and observed around drilling and production operations. These volumes are probably less than one barrel per day, resulting from small amounts of oil remaining on cuttings, after washing, small amounts spilled when hoses are uncoupled and amounts accidentally discharged from work boats. It should be noted that production platforms are provided with below-deck pans and tubing to catch and funnel small amounts of oil which may be related to the drilling equipment for proper disposal onshore. These small amounts of oil are sometimes seen as a sheen on the water near the platform, dissipate within several meters to several hundred meters and are generally considered an insignificant input of hydrocarbons.

Relative Quantities of Effluents: The approximate ratios for effluent discharges resulting from projected oil and gas activities from OCS Lease Sale No. 68 to those effluent volumes expected from the two previous lease sales in the Southern California Bight (Sale Nos. 35 and 48) are given in Table IV.A.5.a-2. In addition, the cumulative volumes of discharge are compared to the total volume of municipal effluents currently being discharged from onshore municipal and industrial sewage treatment plants.

The figures presented for the expected volumes of drilling muds, drill cuttings, formation water and sewage discharged from all OCS oil and gas operations up to and including this sale for Southern California are greatly in excess of the present volumes and may never be reached due to delays in development, dry wells, etc. It is interesting to note, however, that even if projected OCS discharges materialize, the contribution of oil and gas activities to the general pollution burden of the Southern California Bight is usually less than 7 percent of the burden imposed by the five largest municipal-industrial discharges. The exception is the high percentage for drill cuttings as compared to sludge (ecological effects between the two are not strictly comparable due to the size differential of particles). This resulted because of the high projected estimate of the number of exploratory and production wells from previous sales and the consideration of only the Hyperion 7 mile sludge line among all possible settleable solids sources in the Bight. Especially interesting in this comparison of OCS oil and gas activity sources of pollution with the municipal sewage outfalls is the volumes of oil and grease which will enter the marine environment during a 20-year period. No figures can be given for projected oil discharge from oil production platforms since the USGS models used to generate spill probabilities do not give finite spill volumes with expected numbers of spills (only spills greater than or lesser than a cut-off point). The USGS Open-File Report 80-101 lists only one platform blowout in the 8-year period 1971 to 1978. This resulted in less than 1,000 barrels of crude oil being spilled. Projecting from this record, the amount of oil expected to be discharged accidentally from platforms in the Southern California Bight is miniscule compared to the approximately 298,000 barrels of oil and grease being discharged from major sewage outfalls annually. Crude oil and oil and grease from municipal sources may not, as in the case of drill cuttings and sludge, be strictly comparable but the comparison does serve to demonstrate the magnitude of pollution sources in the lease sale area.

TABLE IV.A.5.a-2*

CUMULATIVE DRILLING EFFLUENTS

Source	Drilling Muds (BBL's)	Drill Cuttings (BBL's x 10^6)	Formation Water (BBL's x 10^6)	Sewage (Gal/Day)
Sale No. 35	454,545	1.1	14	120,000
Sale No. 48	469,146	1.052	139.6	54,000
TOTAL	923,691	2.1052	153.6	174,000
Sale No. 68/ Sale 35 + 48	0.24	0.19	1.50	0.17

Municipal-Industrial Discharges	Suspended Solids	Sludge (7 Mile Hyperion)	Flow Total Volume
	26.06×10^6 BBL's	5.631×10^6 BBL's	184.04×10^9 BBL's
	Oil and Grease		
	5.958×10^6 BBL's		

Ratios:

$$\frac{\text{All OCS Lease Sales Mud}}{\text{M-I Discharge Suspended Solids}} = 0.044$$

$$\frac{\text{All OCS Lease Sales Cuttings}}{\text{M-I Sludge}} = 0.44$$

$$\frac{\text{All OCS Lease Sales Formation Water}}{\text{M-I Flow}} = 0.0021$$

$$\frac{\text{Sale No. 68 Muds}}{\text{M-I Discharge Suspended Solids}} = 0.0085$$

$$\frac{\text{Sale No. 68 Cuttings}}{\text{M-I Discharge Sludge}} \simeq 0.0699$$

$$\frac{\text{Sale No. 68 Formation Water}}{\text{M-I Discharge Flow}} = 0.0012$$

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*Volumes given are for the life of each lease sale's projected fields and for comparable 20-year periods of municipal sewage discharge. The latter assumes no increase in discharge.

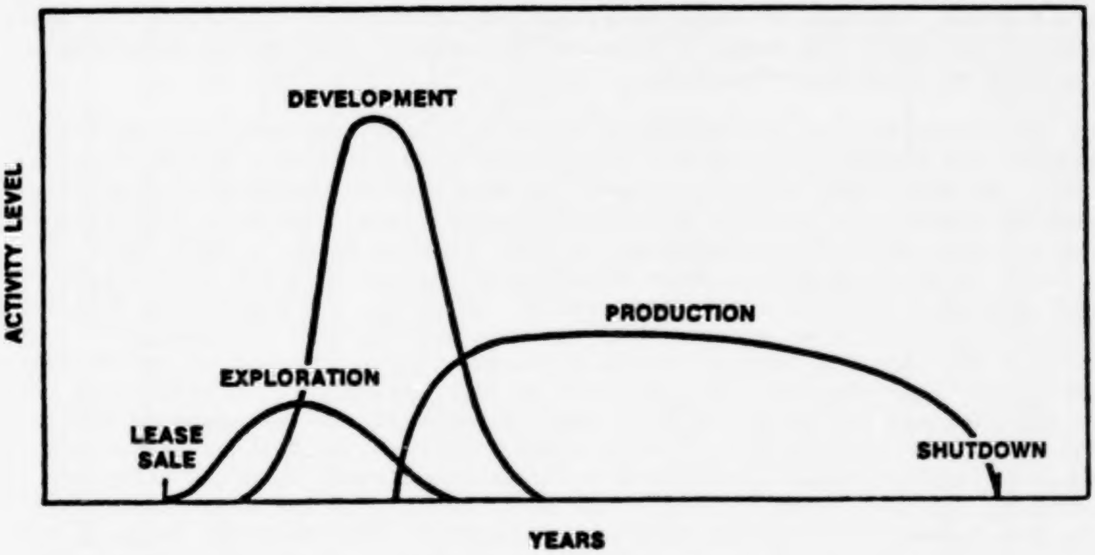
b. Air

i. Sources of Air Emissions: There are seven major air pollutants for which standards have been set to protect public health and welfare. In this section, the emissions of six of these regulated pollutants are discussed for each phase of OCS activity. (The seventh, lead, is not considered an OCS development-related pollutant). Figure IV.A.5.b.i-1 shows how economic activity level varies with time during different phases of OCS oil and gas development. Estimates of pollutant emissions for each of the Sale No. 68 lease zones shows that emissions are expected to vary in proportion to the level of OCS activity. Thus, Figure IV.A.5.b.i-1 indicates the relative magnitude of OCS emissions projected during the course of OCS development.

Emissions during the exploration phase are produced by 1) power generating equipment needed for drilling, 2) tug boats, supply boats and crew boats in support of drilling activities, 3) intermittent operations such as mud degassing, well testing and related operations, and 4) related onshore supportive activities (such as employees' cars and shuttle helicopters). Pollutants involved in this phase of development are primarily nitrogen oxides, carbon monoxide, and sulfur oxides and are projected to occur in the years 1982-1985.

During the development phase, total project emissions increase greatly. The expected stationary emissions sources are reciprocating engines and turbines used to provide power for drilling, and heavy construction equipment used to install platforms. The primary mobile emission sources in the development phase would be the tug boats and barges used for platforms and pipeline installation, and onshore vehicular traffic. The emissions associated with these sources would be emitted along a route which could extend as far as 100 miles from the lease block area. The principal development phase emissions are nitrogen oxides with lesser amounts of sulfur oxides, carbon monoxide and particulate matter. These emissions are projected to begin in 1985, peak near the start of production in each zone, and decline during the following 1 to 6 years.

As indicated in Figure IV.A.5.b.i-1, total pollutant emissions projected during the production phase would be lower than during development. Principal stationary emission sources of nitrogen oxides during the production phase are turbines used to generate power for gas compression, oil pumping, water injection, etc. The major short term source of reactive hydrocarbon (volatile organic compounds, or VOC) emissions during the production phase is from tanker loading/ballasting operations. Potential onshore tankering emissions would occur principally in the Los Angeles area. Emissions in port were considered as a part of the inventory for the resource zone in which the oil was produced. A significant amount of VOC emissions are also produced from oil/water separators, pump and compressor seals, valves, and gas processing operations and onshore storage tanks. On an annual basis, gas processing plants are the principal source of VOC emissions. Other emissions sources during the production phase include exhaust emissions from tanker and barge engines (sulfur dioxide, nitrogen oxides, carbon monoxide) gas processing plants (sulfur dioxide, hydrogen sulfide, and nitrogen oxides), and onshore transportation systems (nitrogen oxides, VOC, and carbon monoxide). Total air pollutant



Source: Modified from Offshore Oil Development on the Georges Bank, CONOCO, 1976.

Figure IV.A.5.b.i-1 Relative Activity Levels During Phases of Offshore Development

emissions would gradually decrease as oil production declines in each tract zone.

ii. Sale No. 68 Emissions Inventory: A complete emissions inventory of the sources described above was prepared as a part of the Sale No. 68 Air Quality Study (POCS Technical Paper No. 68-4). The analysis is intended to estimate conservatively the relative magnitude and distribution of emissions from proposed Lease Sale No. 68 activity. The emission projections have been based upon USGS mean resource estimates for each of the three proposed lease tract areas. Because of large uncertainties involved in estimating the quantities of resources and scope of planned development, the results should be regarded as rough approximations.

In the development of the emissions inventory, mobile sources such as ships, barges, and tugboats contributed significantly to the totals for each pollutant. No additional mitigation measures were assumed beyond those normally used by industry or mandated by existing regulations. Emission limitations on OCS sources, which DOI promulgated in final form on March 7, 1980, were considered in this analysis. These regulations specify emission limitations on each source to prevent significant onshore impacts. The department will require additional controls on sources that may cumulatively have a significant impact. Because the specific information on these additional controls is not currently available, they have not been included in this analysis. The mitigating effect of the proposed California OCS air regulations which DOI proposed on March 7, 1980 have not been considered. For onshore sources, only those pollution controls legally required by State and local regulatory agencies have been assumed. In POCS Technical Paper No. 68-4, details of the assumptions used in the development of this inventory are presented. The reference document also contains projections of the maximum expected daily and hourly emissions of the mean resource estimates along with the annual emissions for the 5% and 95% resource estimates. In general, total annual emissions are roughly proportional to the USGS resource estimates.

Table IV.A.5.b.ii-1 shows total annual emissions associated with peak development and peak production years for each of the six pollutants, each OCS zone and each BLM transportation scenario. From the table, it can be seen that of all pollutants VOC and nitrogen oxides are emitted in the largest quantities followed by sulfur dioxide, carbon monoxide, particulates, and hydrogen sulfide in descending order. Volatile organic compounds and to some extent nitrogen oxides are considered precursors to formation of photochemical smog (primarily ozone). The predicted impact of Sale No. 68 emissions on ozone and other air pollution concentrations is discussed in Section IV.B.

The highest total pollutant emissions are associated with the Outer Banks tracts, followed by Santa Barbara Channel and the Inner Banks. Outer Banks emissions are relatively large owing to significant contributions from tanker and supply vessel traffic traveling the approximately 200 miles round-trip into Los Angeles refineries. In addition, the DOI OCS air quality regulations require less pollution control equipment for developments in the Outer Banks than would be required of developments located closer to shore. As a result of these factors, Outer Banks emissions are somewhat higher than resource estimates

TABLE IV.A.5.b.ii-1

MAXIMUM ANNUAL EMISSIONS ASSOCIATED WITH LEASE SALE NO. 68 OCS ACTIVITIES IN THE PEAK DEVELOPMENT AND PEAK PRODUCTION YEARS, MEAN RESOURCE ESTIMATE

TONS/YEAR--ALL SOURCES (Percent of Emissions from Mobile Sources)[1]

		Emissions				
Zone	Year	VOC	NO_x	SO_x	CO	TSP
SANTA BARBARA CHANNEL						
Pipeline Scenario	Peak Development[2]	51.1(38)	1,356.5(51)	92.0(48)	380.9(62)	67.7(42)
	Peak Production - 1990	132.0(15)	510.2(52)	86.0(22)	163.1(38)	27.0(42)
Barging Scenario	Peak Development[2]	51.1(38)	1,356.5(51)	92.0(48)	386.0(63)	67.7(42)
	Peak Production - 1990	423.5(5)	682.8(53)	96.9(26)	176.8(43)	32.9(47)
INNER BANKS						
Pipelines	Peak Development - 1987	66.0(14)	916.0(24)	176.8(9)	201.3(36)	44.8(23)
	Peak Production - 1989	133.8(4)	478.8(36)	541.5(3)	172.5(28)	23.7(34)
OUTER BANKS						
Tankering	Peak Development - 1989	455.7(4)	1,873.6(49)	249.4(26)	439.4(43)	89.4(47)
	Peak Production - 1992	563.3(5)	1,607.9(62)	252.8(27)	413.3(48)	75.7(60)

1. Based on the emissions presented in POCS Technical Paper No. 68-4.

2. Peak development for both the pipeline and barging scenarios for all pollutants occurs in 1986 except for carbon monoxide which peaks in 1987.

alone would indicate. In all lease zones, total pollutant emissions during the peak development phase are higher than during the peak production year. This is due to the coincident occurrence of high levels of production along with continuing development activities.

Total peak year emissions of NOx, for the Santa Barbara Channel tracts are 4 percent of the existing onshore NO_x emissions. VOC, SO_2, Co and TSP emissions are less than one percent of the existing onshore emissions. Onshore emissions of pollutants in Santa Barbara and Ventura Counties are relatively low compared to the South Coast Air Basin) because of the lack of heavy industry and light vehicular traffic. The pollutants emitted from the Inner and Outer Banks tracts are less than 1 percent of the existing onshore San Diego and South Coast Air Basin emissions.

Table IV.A.5.b.ii-1 also shows the following relationships for Sale No. 68 emissions:

- The year of peak development and peak production emissions is projected to be different for each of the proposed lease zones.

- For NO_x and CO, peak emissions occur during the development phase in all areas. These development-related NO_x and CO emissions are largely due to reciprocating engines and turbines to provide power for drilling; and heavy construction equipment to install platforms. Peak emissions of SO_x, TSP, and VOC generally occur during the production phase. These emissions occur largely as a result of platform turbine operation, tanker loading/ballasting, and oil and gas processing.

- Transportation of Santa Barbara Channel production to Los Angeles by pipeline would reduce VOC emissions by a factor of three compared to barging. The pipeline scenario would also result in slightly lower emissions of NO_x, SO_x, CO, and TSP.

- Approximately one-half of the total Sale No. 68 emissions of NO_x, CO, and TSP for the Santa Barbara Channel and the Outer Banks result from mobile sources.

6. Changes in Economic Activity: Oil and gas leasing activities cause economic and social change in coastal regions as a result of direct, indirect and induced changes in economic activity. These changes may involve both social benefits and losses. Social benefits occur if labor (and possibly land and capital resources) that were previously unemployed or underemployed are used to capacity and there is a net increase in earnings and income in the region. Conversely, social costs may be incurred if, at the same time, these economic changes cause social dislocations and decrease economic and social welfare in the region. The extent of both positive and negative impacts depends on the scope and nature of the action. Impacts from a project may be lessened if the affected regions have the ability to plan for and assimilate changes in economic activity.

The degree to which an area is affected by economic change depends primarily on the size and nature of the existing supply of labor and other economic resources. The important socio-economic indicators are current levels of employment and income, the availability of public and private services, the existing oil and infrastructure and characteristics of the remaining resource base.

Economic impacts to coastal regions potentially affected by proposed Sale No. 68 development have been derived from the Harris Economic Model. The Harris Model is an econometric quantification of many important economic variables on a multi-region, multi-industry basis. A complete description of the data, estimating procedures, and relationships which exist within the model can be found in: Harris Curtis C., Jr. The Urban Economies, 1985. Lexington, Mass: D. C. Heath & Co., 1973; and Harris, Curtis C., Jr. and Frank E. Hopkins, Locational Analysis: An Interregional Econometric Model of Agriculture, Mining, Manufacturing and Services, Lexington, Mass: D. C. Heath & Co., 1972. Its central premise is that in an economy with many economic interdependencies, regional output changes cause changes in employment and income, which affect the regional demand for goods, labor and capital.

Economic changes are measured against base case projections of activity in the region. Forecasts are made by the Harris Model assuming that Sale No. 68 development does not occur. This base case includes projections for other activities expected to occur such as the Liquified Natural Gas Terminal construction, the Missile-X Program, the Space Shuttle Project, oil and gas leasing in State waters and previous OCS Sales (including the 1966 and 1968 Sales, and Sales Nos. 35, 48 and 53). Economic variables are then modified to incorporate anticipated Sale No. 68 development and the model is rerun. The projections are then compared to those for the base case to determine the impact of proposed Sale No. 68.

The primary impact-producing agents which cause social and economic changes are OCS-related employment, investment and income (royalties on production). POCS Technical Paper No. 81-3 describes in detail the economic components that were developed for OCS Sale No. 68. This paper also contains the output tables from the Harris Model showing the difference between the base case and Sale No. 68 projections.

These economic changes just mentioned generate indirect and induced effects (also called multiplier effects) on population, employment and income. These changes may also result in increased demand for community services and facilities and thereby affect public revenues and expenditures. The relationship of employment, investment and income to indirect and induced effects is the subject of the following discussion.

OCS development will generate both direct and indirect employment. Direct employment refers to jobs created by the oil industry which is involved in OCS activities both offshore (exploration, development and production) and onshore (processing and support activities). Induced employment is generated by the spending of OCS-related wages and income. The multiplier effect resulting from an increase in jobs and income related to OCS activity will be spread among many sectors of the regional economy. The total impact on employment and income in an economy resulting from an increase in employment and income in OCS petroleum-related sectors may be several times the initial increase. The chain of secondary expansions of income and production is set in motion once a change has been introduced into the system. The projections made by the Harris Model include the total cumulative effect on employment and income.

In the case of Sale No. 68, direct employment would be greatest during the exploration and construction (development) phases with a slackening off in numbers of jobs as leases are brought into the production phase. In an area where there is unemployment and/or underemployment in the types of employment generated by OCS development, employment increases would be beneficial to the region.

OCS development is also expected to result in capital expenditures for offshore and onshore development. These expenditures stimulate production in equipment and fabricating industries. Secondary demand is created by the increase in production and income in those industries meeting OCS requirements. The market for petroleum equipment extends beyond the adjacent onshore area. Fabrication of platforms, for example, may occur in other areas of the U.S., such as the Gulf States, or in overseas locations.

Changes in the demographic characteristics of an area are usually closely associated with changes in the economy. Population increases result if there is net in-migration to an area of persons seeking OCS-related employment. The magnitude of change is dependent upon the mix and amount of employment generated by OCS development. Although OCS development projects are not usually labor intensive, they are often filled by transient workers because of the short duration of employment and/or the special skills required. Transient workers who decide to remain permanently in the area may change the composition and size of population. As time goes on, however, the local labor participation rate should increase.

Changes in employment and population may change the existing economic base in a region. Economic change and growth may create additional demand for public and private community services and facilities such as schools, health care, housing, police and fire protection and public utilities. Because there are lags in the system, temporary shortfalls could possibly occur, causing crowding and congestion and decreasing public welfare. If industrial onshore development does occur, the property tax base could increase sufficiently to provide for increased public expenditures. The extent of impacts would be less in an area that has a large economic base.

The analysis of impacts expected to occur as a result of the proposed action uses the Harris Model as the source for changes expected to occur in population size and compsition, the general economy and the public sector. POCS Technical Paper No. 68-3 discusses the inputs that were developed for the Model and the results of the Model. Sections C.11, 12 and 13 of this chapter contain a summary of the Model results. Impacts of deletion alternatives are based on modifications of the Harris Model results based on proportionate changes in the resource base.

Quantification given in this analysis represents aggregate county-level changes. Analysis of impacts based on county-level changes may not reveal impacts occurring to particular communities. It is unlikely that changes will be evenly distributed throughout the county. However, impact analysis at the community level is not done due to the uncertainties concerning the outcome of the lease sale, the resource base and future economic and political conditions.

B. Effects of the Physical Environment on Oil and Gas Operations

1. Geology: Oil and gas operations could be affected by geological phenomena or conditions. The primary ones are: sea floor instability, shallow gas, oil and gas seeps, and seismicity and faulting. Section III.A.1.b describes these in detail.

The remainder of this section will discuss structural design for seismic events. The state-of-the-art of structural design for seismic events has advanced substantially during this past decade. Design is performed for two levels of a seismic incident - an operational level and a safety level. Design for an operational event is safety that the structure suffers no damage. At the safety level, damage to and deformation of the structure may occur, but there will not be collapse.

Determination of the acceleration forces to which the structure may be subjected is made by calculating the magnitude of the maximum probable and maximum credible earthquake likely to be generated by faults in the vicinity of the structure.

Bedrock acceleration at the site of the structure is related to the magnitude of an earthquake and its distance from the location. Bedrock acceleration is affected by the character of the overlying soils. In most instances, the overlying soils tend to reduce the forces of acceleration applied to the structure, but in rare cases can amplify it. Once the seismic forces to which a structure may be subjected have been established, the structure is designed to withstand those forces.

Seismic activity, as such, has little effect on pipelines that are free to move. An unconfined pipeline has sufficient flexibility and elasticity that nominal seismic movement has little effect on the integrity of the pipeline. However, if the pipeline is buried the inherent flexibility and elasticity of the pipeline may be reduced to a point that damage is incurred.

Pipelines that cross potentially active faults that reach the surface require special consideration. Geophysical examination of the shallow portion of a fault trace may provide information on the date of the latest movement of the fault. In the absence of proof of recent activity at the tract of a fault, potential damage to the pipeline can be eliminated or minimized by crossing the fault tract in such a manner that the flexibility and elasticity of the pipeline are increased.

2. Physical Oceanography: The physical oceanographic forces of currents and waves are believed to pose no threat to the physical integrity of drilling rigs or production platforms used in the Southern California Bight. Oil and gas structures have been engineered to withstand the maximum expected currents, which are less than 50 cm/sec in the lease sale area, and also the 100-year expected storm waves, which are less than 12 meters in the area. Storms and the associated waves may cause cessation of some activities on rigs and platforms because of danger to personnel transfer from shore boats or the danger and spill hazards involved in off-loading oil from platforms to tankers (if this method of transportation is selected). This is only expected to occur in seas of 3 meters or greater (personal communication by Exxon Hondo platform personnel). Bottom currents are not expected to affect the transportation of oil and gas by pipeline.

3. Meteorology: The Southern California coastal waters experience a high frequency of low clouds and restricted visibilities that could occasionally hinder operations on the OCS. In general, visibility of less than 1 mile occurs on less than 7 percent of all days. Maximum duration of these restricted visibilities is less than 14 hours; thus, extended delays in vessel access of OCS operations is highly unlikely.

Because of its latitudinal position and the influence of the ocean and the Pacific high-pressure system, the Southern California coastal area seldom experiences major hurricanes, tornadoes, freezing conditions or other types of severe weather. Tornadoes, for example, have an estimated return period ranging from 20,000 to 260,000 years. Thus, no significant meteorological effect on operations are expected, although occasional storms and fog could cause temporary interruption of activities.

C. Environmental Impacts of the Alternatives

1. Water Quality

a. Alternative 1: The water quality of the offshore areas of the general lease sale region is good. The water around the Channel Islands and Tanner-Cortes Banks remains relatively unaffected by impacting agents with the exception of slight elevations in a few trace metals (State of California Mussel Watch, 1980), above sea water levels found in areas north of Point Conception. Water quality nearshore, especially adjacent to the major urban centers and sewage outfalls, is degraded to varying degrees.

The agents which can impact water quality are discharged drilling muds, drill cuttings, formation water, sewage, and spilled oil. The volumes and probable sources of these were discussed in Section IV.A.5.a. Degradation of water quality, due to drilling muds, may be manifested as increases in turbidity in the area near the platforms and exploratory rigs (see Final EIS Sale No. 53 for a further discussion) and an increase in chemical oxygen demand also limited to the area immediately around the structures. These impacts should pose no significant problems to either the Inner or Outer Banks subareas, and the impact on the Santa Barbara Channel subarea from this sale activity should not lead to significant water quality degradation (see, however, cumulative section below). The impacts of drilling muds being less than 1 precent of the total municipal discharge of suspended solids in the Bight area will also be restricted to a short period during exploration and drilling of production wells.

Drill cuttings should cause no degradation of water quality in any of the lease sale subareas. Cuttings fall quickly to the bottom after being washed free of any oil contamination and tend to accumulate immediately beneath the platform (see Final EIS Sale No. 53 for a more complete discussion of cuttings). The accumulation of cuttings in the area represents a significant proportion (ca. 40%) of the settleable solids being added to the ocean off Southern California (see Section IV.A.5.a.). However, there is no evidence that these cuttings (4.0 mm in diameter) affect the water column.

Formation water discharged into the marine environment will have a moderate impact on water quality near production platforms. A model of formation water dispersion (Dickey, 1980) predicts plumes up to several kilometers in length, but actual effects will probably be less. (The model used to predict the extent of formation water assumes no chemical kinetics of formation water compounds, which results in an overestimation of trace element plumes.) As noted in Table IV.A.5.a-2, formation water will comprise less than one percent of the total volume of waste discharged into the Bight and even less than the figure given in the table if actual total trace metals are considered. Impacts on water quality in each of the three subareas of the lease sale should be minimal. Elevated trace metal levels, and increased COD (chemical oxygen demand), may result in the water adjacent to the platforms in each subarea.

Domestic sewage from oil and gas activities in the Bight may have slight impacts in the water immediately adjacent to rigs and platforms. Impacts could be elevated bacterial counts and slight increases in nitrate and BOD (biological oxygen demand). Total impacts in each subarea and the entire region should be minimal since the daily volumes of sewage to be discharged are very small given the dilution factors around the platforms and rigs and given the treatment required by NPDES permits and OCS Order No. 8.

The minimal impacts from the agents discussed above are even less likely than indicated because of operating procedures now in use in the OCS areas off California. Drilling muds are commonly reused in many wells and, if oil-based muds are needed, they are not discharged to the environment. Drill cuttings may be barged to onshore disposal facilities in biologically sensitive areas thus, avoiding any contamination of fragile bottom habitats. Formation water is usually reinjected into the oil bearing strata and does not pollute the surrounding water mass.

There are 1.1 spills greater than 1,000 barrels expected from this lease sale and subsequent development. The effects of this on water quality is not expected to be significant (see cumulative section below, however) and any effects should be short-lived (as indicated by the history of the Santa Barbara oil spill of 1969, Straughan, 1971). The one important exception is in wetlands or estuarine areas (for example, Anaheim Bay, Upper Newport Bay, and Tijuana Estuary) where the decreased depths and limited dilution capacity would produce severe impacts reducing oxygen content of the water, decreasing transmittance of light and significantly elevating toxic compound levels in the water column. These effects could be long-lasting if oil reached sediments were trapped there by binding, and slowly released by weathering after the initial impact.

b. Other Alternatives: The impact on water quality, should Alternative 2 be adopted, would be the same as described in Alternative 1 above (see Sections I.B.1.a and II.A. for alternative descriptions). Impacts on water quality should remain substantially the same as predicted for the first alternative, since the numbers of platforms, etc., would not decrease. Adoption of Alternative 3 (Cancel) or 4 (Delay) the Sale should result in either the elimination of the impacts described (3) or their postponement (4). Technological advances, in the case of Alternative 4, could result in reduced impacts if the Sale was held later.

c. Conclusions (Alternative 1): The impacts of Sale No. 68 oil and gas activity should not present a significant threat to water quality in the Southern California marine environment since they generally constitute much less than 7 percent of the pollution load entering the ocean from all sources. Water quality immediately around rigs and platforms may be degraded to a minor degree (although visual inspection of water around Exxon's Hondo platform indicated clean water. Even if the water around a platform was degraded, it should be restored quickly to ambient conditions by dilution.

d. Cumulative Impacts (Alternative 1): The cumulative impact of the OCS oil and gas lease sales in Southern California (Sales Nos. 35, 48, and 68), coupled with increased municipal sewage discharges and thermal effluent from coastal generating stations, will be manifested as continued degradation of the water quality in the Bight, especially in the nearshore areas. The Santa Barbara Channel may experience significant water quality degradation in the future if projected oil spills should occur adding petroleum hydrocarbons to the natural input from oil seeps and to the anthropogenic sources from onshore facilities, which will continue to expand to meet growing population. The manner in which water quality degradation will appear is not predictable at this time. Vague indications of general seasonal surface circulation is known, but the spatial scale and time scale of possibly important circulation patterns is not. This, coupled with little subsurface circulation information, does not allow estimation of the residence time of pollutants in the Channel or identification of small scale eddy systems which might trap cumulative pollutants. The Bureau of Land Management plans to fund a study, beginning in 1981, to define the Santa Barbara Channel circulation. Until this is done, the cumulative effects of oil and gas activity and other pollutant contributing activities on water quality remains uncertain. In addition to the problems of predicting cumulative pollutant transport and water quality effects is the uncertainty of the indirect cumulative effects of possible water quality degradation on marine life in the region. Some knowledge is available (Spies and Davis, 1979; Spies, Davis and Stuermer, 1979) on communities located near oil seeps in the Santa Barbara Channel and the recovery of biota following the Santa Barbara oil spill in 1969 (Straughan, 1971). However, critical information regarding community structure and population dynamics of individual species prior to and after hydrocarbon impacts remains elusive.

2. Air Quality

a. Alternative 1: Effects of possible Sale No. 68 activities on onshore air quality levels have been estimated through the use of computer simulation modeling. The modeling is based upon the emissions estimates and available data on ambient air quality and meteorology. Complete details of the modeling imput parameters and methodology are discussed in POCS Technical Paper No. 81-4.

Two types of models were employed: 1) EPA-approved Gaussian models for the inert pollutants (NO2, SO2 and CO); and 2) RAPT (Reactive Air Pollutant Transport) model for photochemically reactive pollutants such as ozone. RAPT is a trajectory-type model developed specifically for use on the OCS and near-shore areas. This model makes predictions of pollutant concentrations along a path determined by the wind flow. The Gaussian models are modified to account for dispersion conditions on the OCS. Pollutant concentrations are predicted on a receptor grid.

Gaussian models can estimate concentrations within a factor of two when emissions and meteorological impacts are known with high precision. In general practice, results are much poorer and can be in error by an order of magnitude. Worst case analyses were used to minimize the likelihood that impacts will be underpredicted. The worst case assumptions for key analytical parameters are given below.

Impact Modeling Assumptions. The uncertainty in key parameters, such as locations, number of sources, emission rates, production schedules, routing of products, etc., has necessitated a worst case analysis. This method provides estimates of reasonably expected upper limits and reduces the likelihood that impacts will be underpredicted.

The major worst case assumptions used in this analysis are:

- Maximum emission rate developed by assuming simultaneous operation of likely OCS-related emission sources. The lowest degree of emission control required by DOI's National Air Quality Regulations was assumed for facilities on the OCS, while facilities on shore are assumed to meet Best Available Control Technology as required by the Local Air Pollution Control District. It should be noted that DOI is required to impose additional pollutant control requirements on sources that either individually or cumulatively cause exceedances of the DOI significance level or the air quality standards. No controls of this nature have been included in this analysis.

- Adverse meteorological conditions including light wind speeds, direct pollutant transport toward shore and limited mixing rate for short averaging time predictions.

- Most adverse combination of published stack and design parameters (i.e., stack height, gas temperature, effluent exist velocity, etc.).

- No absorption of NO_x and SO_x by the ocean surface is assumed even though some of these pollutants may become dissolved in water.

The combining of these worst case assumptions probably results in an overestimate of potential impacts. More refined impact evaluations will be prepared when detailed project-specific information is available. This evaluation cannot take place until the development plan phase. The intent of this worst case analysis is to identify potential problem areas and to evaluate possible cumulative impacts of Sale No. 68. It should be noted that for a typical situation Sale No. 68 impacts are expected to be much less than those discussed herein. Also, identified impacts are for the peak emissions year. Under the projected development scenario, emissions would decrease an average of nearly 50 percent within 5 years after the peak emission year.

Maximum Inert Pollutant Concentrations. The predicted maximum annual average concentrations for NO_2, SO_2 and TSP are presented in Table IV.C.2.a-1. As Table IV C.2.a.-1 indicates, Sale No. 68 offshore activities will result in onshore NO_2, SO_2 and TSP increments well below the 1 ug/m^3 level considered significant by DOI. The predicted concentrations are also far below the Class I Prevention of Significant Deterioration (PSD) increments that may be required in Channel Islands National Park. The concentration increments for the projected gas plants in the Santa Barbara Channel and Inner Banks zones are, also, well below the DOI and PSD significance levels.

Maximum inert short-term average concentrations are presented in Table IV C.2.a-2. The short average concentration from Sale No. 68 sources range from 3 to 9 ug/m^3 for NO_2, from negligible to 10 ug/m^3 for SO_2 and from negligible to 5 ug/m^3 for CO. These maximum SO_2, NO_2 and CO impacts are within the increments allowable under the DOI air quality regulations. The impacts of any onshore gas processing plants on short-term pollutants are highly dependent on plant location and local topography and, thus, have not been modeled here. Similar-type plants in other areas have been able to meet all applicable air standards.

Maximum Ozone Concentrations. The first task in the photochemical modeling was the selection of probable pollutant trajectories during worst case conditions. In general, the trajectories were selected on the basis of observed meteorological patterns during days of high measured ozone concentrations. In areas with limited meteorological data available, hypothetical worst case trajectories were constructed.

The constructed trajectories, and their associated meteorological, air quality and non-OCS emissions data, were then modeled to generate an ozone baseline for comparison of simulated and observed ozone onshore. Modeling is in terms of 1-hour averages to correspond with the air quality standard for ozone. Baseline non-OCS emissions were then adjusted to account for anticipated conditions during the peak years of Sale No. 68 activities as documented in State Implementation Plan documents. Constructed cases of worst-case OCS emissions were then developed and appropriate OCS emissions introduced into the baselines and rerun. The difference in predicted ozone concentrations

TABLE IV.C.2.a-1

SUMMARY OF HIGHEST COMPUTED ANNUAL AVERAGE ONSHORE CONCENTRATIONS

	Highest Onshore Concentrations ($\mu g/m^3$) From						Future Predicted Onshore Concentrations[3] (Concentrations without Project/ Concentrations with Project) $\mu g/m^3$		
	Offshore Activities			Onshore Gas Plant[2]					
Zone	NO_2	SO_2	TSP	NO_2	SO_2	TSP	NO_2	SO_2	TSP
Santa Barbara Channel	0.1	0.03	NEGL.	0.1	0.02	NEGL.	71/71.1	18/18.03	64.5/64.5
Inner Banks	0.4	0.09	NEGL.				71/71.4	24/24.1	52/52
Outer Banks	NEGL.	NEGL.	NEGL.				56/56	8/8	69/69
National AAQS[5]	100	80	75	100	80	75			
California AAQS[5]			60			60			
DOI/PSD increments[6]		2/20	5/19		20	19			
DOI significance levels[7]	1	1	1						

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1. Concentrations as calculated by the CDM model are for peak emissions transportation scenario.

2. The gas processing plant is hypothesized under Alternative 1.

3. Numbers indicate measured 1979 annual average concentration at the point of predicted maximum sale 68 impact. Actual 1991 concentrations will likely be lower.

4. Numbers indicate measured 1979 pollutant concentrations at the point of predicted Sale 68 impact. Atual 1991 concentrations will likely be lower.

5. National and California Ambient Air Quality Standards (AAQS).

6. DOI and EOA PSD maximum allowable increments. The smaller DOI increments are for assessing the potential Channel Islands Class I area near the Santa Barbara Channel tracts.

7. DOI and EPA significance levels applicable to an onshore area in attainment of the national AAQS. Onshore areas not in attainment of the AAQS may not be impacted by OCS activities.

TABLE IV.C.2.a-2

SUMMARY OF HIGHEST COMPUTED SHORT-TERM AVERAGE ONSHORE CONCENTRATIONS FROM OFFSHORE ACTIVITIES[1]

	Concentrations ($\mu g/m^3$) and Averaging Periods								Future Predicted Onshore Concentrations[4] (Without Project/With Project)			
	NO_2	SO_2			TSP	CO			NO_2	SO_2	TSP	CO
Zone	(1hr)	(1hr)	(3hr)[2]	(24hr)[3]	(24hr)[3]	(1hr)	(8hr)[2]	(12hr)[2]	(1hr)	(24hr)	(24hr)	(8hr)
Santa Barbara	6	1	1	NEGL.	NEGL.	2	2	2	319/325	209/210	156/156	1,500/1,502
Inner Banks	9	10	10	5	NEGL.	3	3	3	469/478	183/188	139/139	18,000/18,003
Outer Banks	3	NEGL.	NEGL.	NEGL.	NEGL.	1	1	1	563/566	287/287	163/163	21,000/21,001
National AAQS[5]			1,300	365	150	40,000	10,000					
California AAQS[5]	470	1,310		131	100	46,000		10,000				
DOI/PSD increments[6]		25/512	5/91	10/37								
DOI significance levels[7]			25	5	5	2,000	500					

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1. Concentrations are in $\mu g/m^3$, as calculated for one-hour averages (or otherwise as noted) using the PT series of EPA-approved Gaussian Models (US EPA, 1978).

2. Specified concentration equals the computed one-hour average concentration. This assumes that the wind holds steady throughout the specified averaging period, which is an unlikely worst case.

3. The 24-hour average computed concentration assumes that the wind holds steady in speed and direction for 12 out of 24 hours. (During the remaining 12 hours the wind is assumed to shift offshore, or otherwise change direction.)

4. Numbers indicate measured 1979 pollutant concentrations at the point of predicted Sale 68 impact. Actual 1991 concentrations will likely be lower.

5. National and California Ambient Air Quality Standards (AAQS).

6. DOI and EOA PSD maximum allowable increments. The smaller DOI increments are for assessing the potential Channel Islands Class I area near the Santa Barbara Channel tracts.

7. DOI and EPA significance levels applicable to an onshore area in attainment of the national AAQS. Onshore areas not in attainment of the AAQS may not be impacted by OCS activities.

with and without Sale No. 68-related development represents the simulated ozone increment due to the proposed action.

Fourteen cases involving operational emissions were run. Ozone increments varied from none through 2.1 parts per hundred million (pphm) (Federal Ozone Standard is 12 pphm). Most increments were less than 0.1 pphm. Table IV.C.2.a-3 summarizes simulated baseline ozone, Sale No. 68 simulated ozone levels and simulated points of maximum ozone concentrations. All cases assume worst-case meteorology insofar as it could be determined from available data. It is estimated that worst-case meteorology, as used in the study, can occur several times during the summer off each OCS zone. Highest ozone increments resulted from the hypothetical trajectories applied to modeling the Ventura and South Coast areas. All increments in the San Diego and Santa Barbara area were negligible. Based upon an examination of the photochemical modeling results, it appears that Sale No. 68-related ozone precursers are not emitted in a proportion favorable for formation of photochemical oxidants. For significant ozone impacts to occur, substantially greater emissions of reactive hydrocarbons would need to be present in the vicinity of OCS-related sources.

b. Other Alternatives: Deletion of the tracts within the Channel Islands National Marine Sanctuary (Alternative 2) will not materially alter the air quality impacts discussed above. Cancellation of the sale would eliminate the impacts discussed above, while postponing the sale would merely delay these impacts.

c. Conclusions (Alternative 1): Sale No. 68 activities, of themselves, are not expected to cause violations of any State or National Ambient Air Quality Standard, nor deteriorate air quality to a degree considered significant.

d. Cumulative Impacts (Alternative 1): Southern California has what many consider to be the most severe air pollution problem in the nation. Ozone standards are violated on an almost daily basis. In addition, air quality standards for NO_2, TSP and CO are violated frequently. During the peak emission year, Sale No. 68 activities would add nearly one half of one percent (0.5%) to existing NO_2, TSP and CO concentrations at the point of maximum impact (see Table IV.C.2.a-1). Worst case ozone, NO_2, TSP and CO impacts for the short-term air quality standards are less than 10 percent and generally less than one percent of existing levels. These worst case impacts are considered insignificant exacerbations of an existing condition. SO_2 increments from Sale No. 68-related sources, in combination with existing levels, are not expected to cause violations of standards.

The cumulative impact of all projected OCS development in the Southern California Bight was also considered in the RAPT modeling. These results show that the cumulative impacts of projected OCS developments through 1991 (including Sale No. 68 and all previous federal leasing) are not expected to significantly affect ambient air quality onshore. The major contributing factors to this result are: 1) OCS emission sources (both stationary and mobile) are widely separated, 2) emissions from all sources do not occur simultaneously and 3) pollutants disperse somewhat in the distance between the OCS and the shoreline.

TABLE IV.C.2.a-3

SUMMARY OF OZONE IMPACT RESULTS[1]

Trajectory	Peak Year Ozone Levels (1991) Future Concentration[2] Without Sale No. 68	Peak Year Ozone Levels (1991) Maximum Sale No. 68 Increment	Cumulative Increment of OCS Development since 1978
Santa Barbara I	26	NEGL.[3]	NEGL.
Santa Barbara II	25	NEGL.	NEGL. to 2.1
Santa Barbara III	12	NEGL.	NEGL.
Ventura I	15	NEGL.	NEGL.
Ventura II	19	0.2 to 0.4	NEGL.
Ventura III	12	NEGL. to 0.4	NEGL. to 0.2
South Coast I	48	NEGL.	NEGL.
South Coast IIA	31	NEGL. to 2.1	0.3 to 2.3
South Coast IIB	31	NEGL. to 0.9	0.1 to 1.2 Obispo
South Coast III	48	NEGL.	NEGL.
South Coast IV	20	NEGL.	NEGL. to 0.2 Barbara
San Diego I	22	NEGL.	NEGL.
San Diego II	27	NEGL.	NEGL.
San Diego III	17	NEGL.	NEGL.

1. Levels in parts per hundred million (pphm; 100 pphm=1 ppm) of ozone. California State, and national, 1-hour standards are 10 pphm and 12 pphm, respectively. These runs modeled various high emissions scenarios. Refer to Technical Paper No. 68-4 for details.

2. Future concentrations are predicted by the RAPT model using projected 1991 regional emissions and measured 1978 offshore pollutant concentrations. Because existing offshore pollutant concentrations were assumed, projected future concentrations are probably overestimated.

3. Increments of less than 0.1 pphm are considered negligible.

Based upon projected low emissions of visibility reducing substances (mainly sulfates and its precursor SO_2), Sale No. 68 activities are not expected to significantly affect onshore visibility or odor levels. Odor levels should not be significantly affected since modeling results show H_{2S} concentrations well below the odor threshold.

A large oil spill could cause a significant increase in ozone levels for a short period, if spill characteristics and meteorological conditions are conducive to ozone formation at the time of the spill. Because the meteorological and spill characteristics are unknown, the magnitude of this potential impact cannot be determined.

3. Plankton

a. Alternative 1: The impact on phytoplankton and zooplankton in the lease sale region will come from drilling muds, formation water (if it is discharged) sewage, and spilled hydrocarbons. These agents and their effects on plankton have been discussed in detail in Section IV.A.1.c. of this document and in past environmental impact statements (see Final EIS for OCS Lease Sales Nos. 35, 48, and 53). The deleterious effects of oil and gas activity on plankton populations, especially oil spills, is felt to be nonsignificant, due to the spatial and temporal variability of plankton in the marine environment (Strickland, 1967; Riznyk, 1977; Balech, 1960). Phytoplankton may experience small blooms in the areas around spills, not within the spills.

The expected number of spills in the lease sale area will not significantly raise long-term hydrocarbon concentrations above present ambient levels (0.1 to 20 ppb) in the Bight. This range is very much below the 0.1 ppm aromatics level which Prouse, et al. (1976) indicates is the concentration at which toxic effects on phytoplankton begin to occur and is in the range in which enhancement of phytoplankton populations is experienced. Thus, blooms of phytoplankton may result at some distance from the spill or at some time after the spill dissipates.

Plankton trapped within spills will experience mortality, but replacement by advected populations should occur rapidly after the oil has dissipated, weathered or transported from the area. Plankton populations should recover quickly once the oil is removed. However, if a very large spill (like the Ixtox blowout) was trapped in an eddy system, such as might occur in the Santa Barbara Channel, it could produce significant impacts on the phytoplankton for a period long enough to affect zooplankton grazing on phytoplankton. Thus, zooplankton populations could be reduced, in turn affecting the carrying capacity of the marine environment for higher trophic levels. This scenario is thought to be unlikely, because the oil and gas formations known in the Lease Sale No. 68 area and the subarea of Santa Barbara Channel do not seem to have the high pressures which could cause a sustained massive spill and the estimated reserves in these formations are not as large as the fields under the Ixtox wells.

b. Other Alternatives: The impacts to plankton from oil and gas activities in the Lease Sale No. 68 region, should Alternative 2 be adopted, would be the same as described in Alternative 1, above (see Section I.B.1.a. and II.A. for alternative descriptions). If Alternative 2 is not adopted and drilling occurs on tracts within the proposed sanctuary, impacts on plankton should remain substantially as predicted for the first alternative.

If the sale is cancelled, none of the impacts described would occur. Delaying the sale would simply postpone the potential impacts. Note, however, if either of these two alternatives were chosen and oil imports were increased to "fill the void," impacts could increase. This is because there is a greater spill risk from tankers than from OCS development.

c. Conclusions (Alternative 1): Oil and gas activities due to OCS Lease Sale No. 68 will have no significant impact on plankton populations with the possible exception of populations in the Santa Barbara Channel where the phytoplankton could be significantly reduced should an Ixtox-type spill occur.

d. Cumulative Impacts (Alternative 1): Cumulative impacts on plankton in the Southern California Bight, from all activities discussed in Section IV.A.5.a., may include changes in the plankton species composition in nearshore areas and a general increase in plankton biomass as a result of increased nutrient levels from all hydrocarbon sources. The changes in species composition of phytoplankton and zooplankton may be difficult to ascribe to anthropogenic influences, since recent data and analyses (Cal-COFI, 1980) seem to indicate that large-scale advection of water masses may change species composition over time. This phenomenon is also highly correlated with the measured biomass of plankton standing crops and serves as a better predictor than the traditional measure of upwelling.

4. Benthos

a. Alternative 1

i. Intertidal Benthos: Impacts on the intertidal can be caused by oil spills or by pipelines coming ashore. More detailed coverage of these impacts can be found in the FEISs for OCS Sales No. 35 and 48 (U.S. Department of the Interior, 1975, 1979a) and Section IV.A.1.c.

Impacts from drilling and pipeline laying will be relatively minor. The damage from oil spills could be severe to the rocky shore intertidal, particularly at small isolated areas. Smothering will cause the principal damage to specific upper intertidal species of plants and animals, where all individuals oiled will die. Although the entire intertidal community will not be killed, many individuals of a variety of species will be. Reproduction and repopulation will be retarded for several months, and the extinction of rare endemics is a possibility. Biological recovery will take up to five years, while community stature recovery will take up to ten years. The time of recovery to normal population structure will depend upon the vertical level. The upper barnacle zone should require the least time of any of the vertical levels. This can be accomplished in a year. The slowest zone to recover will be the more complex middle and lower levels. The time for these areas to recover will vary from somewhat over a year to up to ten years in the case of a completely destroyed mussel bed. In general, intertidal macrophytes rapidly reestablish their overall cover percentage on disturbed surfaces, while the macroinvertebrates recover slowly. Several populations of macrophytes and macroinvertebrates were determined to be highly sensitive to disturbance and showed very slow recovery. These included the algae Pelvetia fastigiata, P. fastigiata f. gracilis, Hesperophycus harveyanus, surf grass Phyllospadix torreyi and P. scouleri for the macrophytes. Populations of sessile bivalves, including the mussels Mytilus californianus, M. edulis, Septifer bifurcatus, Brachidontes adamsianus, and the clam Pseudochama exogyra all reveal incomplete recovery after 24 months for the macroinvertebrates. Additionally, the mobile chitons, urchins, and the anemones showed slow recovery. Although it is unlikely, the possibility of long-term damage (even less likely permanent) to the intertidal community of the Santa Barbara Channel resulting from cumulative actions does exist.

Areas which have rocky intertidal assemblages or species of unique characteristics are as follows:

(1) Northwest coast of San Nicolas Island - Numerous large tidal pools and a northern sea cucumber Cucumaria pseudocurata which has only been found here and in Santa Barbara Island.

(2) Santa Barbara Island. The northern sea cucumber Cucumaria pseudocurata found intertidally in the Bight only here and at San Nicolas Island. The limpet Siphonaria brannani, an air breather having lungs rather than the usual gills, was found only here.

(3) Santa Rosa Island, inner coast. With extensive areas containing dense beds of the algae Pelvitia sp. and isolated areas of dense populations of black abalone.

(4) San Clemente island, outer coast. Usually rich and diverse assemblage.

(5) Several mainland rocky intertidal areas which are geographically separated from other significant rocky intertidal areas by 15 miles (24 km) to 40 miles (64 km).

These areas are located around:

Location	Separated from	By Distance-km	
Santa Barbara	Point Conception	50	(31 mi.)
	Point Dume	64	(40 mi.)
	Channel Islands	29-56	(18-35 mi.)
Point Dume	Santa Barbara	64	(40 mi.)
	Palos Virdus	35	(22 mi.)
	Channel Islands	43	(27 mi.)
Palos Virdus	Point Dume	35	(22 mi.)
	Channel Islands	24	(15 mi.)
	Newport	32	(20 mi.)
Newport-Dana Point	Palos Virdus	32	(20 mi.)
	Channel Islands	48	(30 mi.)
	Oceanside	64	(40 mi.)

These distances are a conservative simplification as they do not consider smaller patches of rocky intertidal groins, or coastal stacks which contain intertidal organisms. Some of these smaller intertidal structures are located between the major areas listed above.

(6) Small areas within larger mainland coast rocky intertidal stretches which have an unusually rich or diverse assemblage compared to surrounding areas. These areas include:

(a) Treasure Cove on Irvine Coast - tide pools in area little disturbed by human shore walkers,

other areas of Irvine Coast reported by Kelley (personal communication) to have diverse, relatively undisturbed assemblages,

(b) Cresent Bay,

(c) Salt Creek Area,

(d) Dana Point.

Regarding sensitivity to a large oil spill, high ecological loss would most probably occur at the tide pool area of northwest San Nicolas Island (Number 1 above) during the low tidal periods when oil could cover these pools characterized by shallow calm water with little circulation. If heavy coats of oil cause the dislodgement of the algae Pelvetia as it did with the closely related Hesperophycus during the Santa Barbara oil spill, Santa Rosa Island (Number 3 above) will suffer high ecological loss. Recent evidence indicates it may require Pelvetia over four years to recover. Not only are the algae themselves a major constituent of the assemblage, they also serve as an important cover and hiding area for smaller invertebrates during low tide. With this cover missing many of the smaller invertebrates will undoubtedly suffer mortality. The final island which may suffer a high ecological loss is Santa Barbara Island. The limpet with lungs, Siphonaria brannani is a numerically dominant and presumably important member of the middle intertidal community. Its loss would probably alter ecological interactions within the community. Although it would seem logical that an organism directly dependent on air during low tide would suffer heavy mortality if coated with oil, it has yet to be demonstrated that this would be the case.

The largest consequence of impacts on the isolated mainland coast intertidal areas (Number 5 above) revolves around recovery of the populations, assemblages, or species which have been either completely wiped out or greatly reduced as the result of a large spill. Repopulation from a population completely wiped out must come from brood stock outside the area. Larvae from species previously in the area may not reach vacated areas as rapidly as if they were spawned from within the area itself. Once repopulation commences, recovery probably would proceed as summarized above, although different species could, as a result of advantageous setting periods, out-compete the original dominants and become dominants themselves.

The extent of the damage to a sandy beach intertidal community will be less than that to a rocky shore community. The extent of the damage from large spills is unkown but is not expected to be the complete destruction of a community. Cleanup operations of intertidal areas could cause total destruction or significantly harm the communities of the sandy beach areas actually cleaned.

The areas having a 5 percent or greater probability of receiving a hit from a greater than 1,000 barrel oil spill within 30 days will be considered in the oil spill model analysis. This time period will indicate the maximum probability of a hit.

According to the oil spill model only one land segment of the mainland coast (Segment 31) has a 5 percent or greater probability of a hit with a greater than 1,000 barrel spill (none have a 5 percent probability for an over 10,000 barrel spill). This segment is in Ventura County on the Santa Barbara Channel and contains primarily sandy beach intertidal shores with few rocky intertidal areas. The probability of a high ecological loss here is low.

Santa Cruz Island has a 5 percent (inner shore) and 1 percent (outer shore) probability of a hit with a greater than 1,000 barrel spill within 30 days, for a combined probability of 6 percent of a spill reaching either shore. The most likely impact on the rocky intertidal from a single spill of this size is low to moderate.

Of the inner banks region, Catalina Island has a 10 percent probability (inner shore) and a 3 percent probability (outer shore) of a hit with a greater than 1,000 barrel spill within 30 days for a combined probability of 13 percent of oil reaching either shore. This is the only area (inner shore) which has a 5 percent probability of a hit from a large (greater than 10,000 barrel) spill as the result of OCS Sale No. 68. The most likely impact from the moderate spill (between a 1,000 to 10,000 barrel spill) is low to moderate (Section IV.A.1.c), while that for the large spill must be considered moderate to high. The high impact would occur if the weight of the oil causes dislodgement of a significant amount of common mid-intertidal algae Pelvetia.

According to the oil spill model, on the outer banks, San Clemente Island's intertidal area has a 3 percent probability (inner shore) and a 5 percent probability (outer shore) of a hit with an oil spill of over 1,000 barrels within 30 days for a combined probability of 8 percent of a hit on either shore. The most likely impact to the intertidal will be low to moderate.

In conclusion, considering the whole Southern California Bight, Sale No. 68, with its predicted one medium-size spill, the impact is expected to be low to intertidal biological assemblages.

ii. Subtidal: Environmental impacts which may be expected to affect benthic life adversely will result from the discharge of drill cuttings, accidental spillage of oil (and associated use of emulsifiers) and other toxic materials, and the burial of newly-constructed pipelines. A description of the marine benthic communities may be found in Section III.B.2.b

Spilled oil which has not evaporated, been cleaned up, or stranded on a beach after being dispersed into the water as droplets, adheres to particulate matter and sinks to the bottom where it comes into contact with the benthos.

Newell (1948) and Valentine (1966) suggested that a significant number of endemic molluscs, some with a distribution restricted to 1° or 4° latitude, occur within the California Bight. This endemism also occurs in other taxonomic groups (Newman, 1979 and personal communication, 1974). Newell obtained his data from the list compiled by Keen (1937). The names of the endemics occurring from Point Conception to the Mexican border from Keen's report are available at the Pacific OCS office but are not included in this EIS because of space restrictions. Valentine updated his data from a variety of sources, chiefly Bunch (1944-1946). Valentine reported 180 species of Bivalvia and Gastropodia, alone, had a north-south geographic range of only 96 km (60 miles) within the Bight area.

It is easy to speculate the obvious implication of this: severe or chronic alteration of comparable areas of the environment could eliminate endemic species forever. It is doubtful that a single large spill could wipe out many if any subtidal benthic species by itself. The effect of widespread chronic oil pollution or a large oil spill in combination with other types of environmental alterations is not known, but could contribute to the extinction of some of these endemics. The area having the highest concentration of endemics is the Santa Barbara Channel which is also the area of most oil activity.

Other areas having benthic assemblages which may be sensitive to oil operations or spills are: 1) the rocky outcrops off Point Conception which may contain unusual benthic assemblages due to the unusual location of the area at the division point of two biogeographic provinces; 2) Santa Rosa-Cortes Ridge, because of its unusual species (see Section III.B.2.b); 3) Tanner and Cortes Banks because of its highly productive community and coral population.

Little evidence exists that kelp is harmed by oil. Large beds protect the coastal intertidal areas from oil impacts. Under extremely heavy repeated oilings, the reproductive biology of kelp may be interfered with, but this is speculative. The expected impact will be the mortality of many canopy associates which range from invertebrates through fish. Particularly susceptible are probably the microcrustacea, especially mysids. Because of the rapid reproductive rate and short life cycle, the population of most of these associates should return to prespill levels within a year.

According to the oil spill model, there is a 10 percent probability of a greater than 1,000 bbl spill reaching Tanner or Corte Bank within 30 days (a 5 percent probability of a spill greater than 10,000 bbl hitting the area). Since most of the oil passing over the banks will not contact the bottom community, the impact from a large spill will most probably be small (Section IV.A.1.c). Widespread mortality and destruction to a few species which may be extremely sensitive to oil cannot be ruled out, however. Since the ecological relationships between many species in a complex community as this are incompletely known, there is a possibility of a high ecological loss. This is the only benthic area (Outer Banks) having a 5 percent or greater probability of a hit according to the oil spill model.

b. Other Alternatives

i. Intertidal Benthos: The Channel Islands National Marine Sanctuary, consists of the water surrounding the northern Channel Islands (San Miguel, Santa Rosa, Santa Cruz, and Anacapa) and Santa Barbara Island from the high tide line seaward for 6 miles. This includes 3 miles of Federal water. This 3 miles will be included in the sale if Alternative 2 is not selected. This will include 13 complete and 24 partial tracts. The estimated petroleum reserves gained by these additions is less than 3 percent of the mean risked resources for the entire sale area.

The biological justification for the marine sanctuary is that the island shelf, much of which extends to 6 miles from the island, is the critical area for the highly diverse and productive waters adjacent to and on the shores of these islands. This importance extends not only to obvious things like intertidal, subtidal, kelp, and fish communities, but also to the many birds and breeding and foraging pinnipeds (seals, etc.) which are dependent on the islands. The islands are State-designated Areas of Special Biological Significance (ASBS) which are "those areas containing biological communities of such extraordinary, even though unquantifiable, value that no acceptable risk of change in their environments as a result of man's activities can be entertained." The outer limit of ASBS is one nautical mile or to a depth of 300 feet (91.4 m) whichever is further (California Water Resources Control Board, 1974). In the case of the Channel Island National Marine Sanctuary, a significant proportion of the island shelf shallower than 300 feet extends past the state 3-mile limit into Federal waters, and much of the rest extends approximately to the 3-mile limit. Much drilling, therefore, would (through platform placement or drilling muds-fluids-cuttings transport) violate the intent of the law if not the law itself.

The islands have recently become a National Park, designated as a "low use" area, which extends 1 nautical mile from shore (Section I.B.8.c).

The greatest advantage the additional lease area has for reducing the chance of impacts on the intertidal of the islands is the increased time required for a spill to reach the shores. The minimum time required for an oil spill to travel from the 3-mile Federal-State authority line to shore is 5 hours during 20 mph winds and 4 hours during 25 mph winds. According to the State Air Resources Board Staff Report, winds of over 22 knots (23.1 mph) occur approximately 15 percent of the time. The time required for a spill to travel from the inner edge of the marine sanctuary (6 miles from shore) would be double, or 8 hours and 10 hours for 20 and 25 mph winds respectively.

The oil spill model does not predict the probability for oil to reach at least one of the islands, but it would be less than 30 percent. Wave heights are not a limiting factor for oil containment/cleanup operations for more than 30 percent of the year. That is, 70 percent of the time cleanup attempts would be expected to be successful (see Section IV.C.8.a.i.).

Therefore, if additional time were available to contain an oil slick, it usually could be utilized. This is unlike Northern California, for example, where wave conditions are often too severe to successfully divert oil for such long periods that it would make little difference if the cleanup personnel had several additional hours or not. Deleting the tracts and partial tracts to the Sale will increase the ability to prevent a moderate to possibly high ecological loss to the intertidal communities of the Channel Islands and prevent a high impact in terms of significant legal designations, i.e. ASBS, National Park, Marine Sanctuary.

ii. Subtidal Benthos: The biological justification for the marine sanctuary relates to protection of the important island shelf area. This is discussed in more detail in the intertidal part (i) of this subsection. In terms of benthic biology, impact will be small unless drilling is conducted on hard bottoms. Although Weldy and Williams (1975) report only one large rocky bottom near or within the sanctuary, Fauchald and Jones (1977) found that many bottoms were too rocky to sample with a box core on the adjacent Santa Rosa Ridge. This shows the area may have more rocky substrate than originally suspected.

Deletion of the Santa Rosa-Cortes Ridge tracts will increase the time for cleanup or diversion operations a minimum of four to five hours. Although it has been assumed that an impact from a spill will result in a low ecological loss to a shallow water rocky bottom, the question has not been completely answered.

The Delay or Cancel Alteratives will postpone or eliminate expected impacts, unless their adoption resulted in increased tanker imports.

c. Conclusions (Alternative 1) - Intertidal: In conclusion, impacts from drilling and pipeline laying will be relatively minor. The most probable impact from an oil spill will be a low to moderate ecological loss. Exceptions to this are several unusual or small isolated intertidal areas, particularly the northwest coast of San Nicolas Island, the inner coast of Santa Rosa Island, and possibly Santa Barbara Island.

The most probable impact on sandy beaches from a spill will be a low ecological loss. Cleanup operations could cause a high ecological loss. Although it is unlikely, the possibility of long-term damage to the intertidal community of the Santa Barbara Channel resulting from cumulative actions does exist.

The effects of chronic long-term oil pollution on intertidal communities is not known.

Conclusions-Subtidal Benthos: Low and localized impacts will most likely result from drilling, and pipeline burial. A large spill with maximal sinking will probably have minor impacts on soft bottom subtidal benthos. Areas of greatest concern, where impacts may be greater than low or minor are the rocky outcrops off Point Conception, Santa Rosa-Cortes Ridge, and Tanner and Cortes Banks. The impact of a small spill will be neglibible, although the impacts from prolonged chronic pollution is not really known.

d. Cumulative Impacts (Alternative 1)

i. Intertidal: The oil spill model for the cumulative oil and gas development impacts which considers tankering of imported oil and the previous sales held in California predicts 23 spills over 1,000 barrels and 11 large spills over 10,000 barrels. All but two 26-mile land segments and islands (93 percent) have a 5 percent or greater probability of receiving at least a 1,000 bbl spill. The range of probabilities for all possible segments is between 4 percent and 92 percent. Seventeen of the land segment categories (59 percent) have a 5 percent probability of receiving a large (over 10,000 bbl spill). Although these figures may be somewhat overestimated because of improved operating procedures and overestimation of recoverable petroleum reserves, they illustrate the problem which arises when an area, such as the Bight, becomes heavily developed. The potential for spills (and at least some impacts) and even multiple spills becomes high. As mentioned above (Section IV.C.4.a.i), the most probable impact on a rocky intertidal area from a large single spill is a moderate ecological loss, except for certain sensitive habitats indicated in that section. Multiple spills of moderate to large size (over 1,000 barrels) will eventually cause a high ecological loss depending upon frequency, number, and particular habitat. However, the ability to predict the probability of two or more spills hitting the same intertidal area is even less developed than the predictability of a single spill. The probability would be less, although the extent of reduction unknown. The most likely ecological loss on a sandy beach intertidal habitat on the coast of Southern California will be low, occasionally moderate with large spills on a broad gently sloping beach.

The intertidal areas mentioned in the -a part of this Section having a 10 percent chance or greater probability of a hit with a large spill (over 10,000 barrels) after 30 days are presented below. San Nicolas and Santa Barbara Islands are included because of their importance and probable sensitivity.

-	Northwest coast (north coast of the oil spill model) of San Nicolas island	8 percent
-	Santa Barbara Island.	8 percent
-	Santa Rosa Island, inner or northern coast.	23 percent

The isolated mainland coast rocky intertical areas having a lesser, but possible high, ecological loss are:

-	Santa Barbara	31 percent
-	Newport to Dana Point	64 percent

It would appear from these data that the most critical area is Santa Rosa Island, followed by the Santa Barbara mainland rocky intertidal in the Santa Barbara subarea and the Irvine coast (Newport to Dana Point) in the Inner Banks subarea.

Combining the cumulative impacts of oil and gas development with those of other human projects which effect the environment shifts the area of concern to the mainland coast. The projects which effect the marine environment the most are human development, population expansion, and sewage outfalls from domestic and industrial use and land runoff.

One of the largest disruptions to the intertidal is from sightseers who disturb or collect specimens and by people who collect specimens for food. Domestic pollution has apparently reduced the diversity of rocky intertidal assemblages near heavily populated areas (Littler, 1979). Detailed data on the amount of discharged pollutants is presented in Section III.A.3.

As populations spread out, the affected intertidal will expand while, at best, slight improvements of the presently affected intertidal areas will occur. The intertidal around the cities of the Southern California Bight, particularly Los Angeles, have already suffered high ecological losses according to available evidence. In conclusion, more high ecological losses are expected for portions of the southern California intertidal.

ii. Subtidal: When considering the cumulative impacts from OCS oil and gas activities, this subsection will consider only the important and possibly sensitive areas with a probability of 10 percent or more of a large oil spill (over 10,000 bbl) passing over them.

Tanner and Cortes Banks have a combined probability of 44 percent of a hit, while the deep rocky outcrop area off Point Conception has a less than 10 percent (9 percent) probability (based upon the nearest land segment). The probability of a large spill passing over Santa Rosa-Cortes Ridge was not calculated in the oil spill model, but since this area is included substantially in other leases of the outer banks, the probability must be fairly high. The impacts to the subtidal benthos predicted from a spill are low to all but a few species which may be extremely sensitive to oil spills. A possibility of a high ecological loss does exist.

Combining the cumulative impacts of oil and gas development with those of other human activities of the Bight the areas of highest impact shifts to the mainland coast. Domestic and industrial sewage, land runoff pollutants, and population pressure in the form of shipping and recreational activities have already altered many portions of the subtidal off large cities, particularly Los Angeles (Fay, 1972). According to Fay and others evidence indicates that the benthos on parts of the mainland shelf have already undergone high ecological losses. These impacts will continue to be the principal impacts near large cities in Southern California for the foreseeable future.

5. Fish and Fisheries

a. Alternative 1: Oil spills can impact fish, commercial fisheries and sport fisheries by causing short-term acute impacts to marine life or long-term sublethal impacts. These impacts are discussed in Section IV.A.1.c. To increase our knowledge of these effects, BLM has contracted Marine Biological Consultants to conduct a California commercial and sportfish oil toxicity study (see Section I.B.4).

An oil spill also could impact fisheries by causing a temporary reduction in fishing space and time. It is unlikely that commercial and sport fishermen will harvest in the area of an oil spill because: 1) their boats and gear may be contaminated, 2) they may be confined to port by oil containment booms, and 3) direct coating and incorporation of petroleum hydrocarbons can cause tainting of marine organisms, rendering them undesirable or unmarketable.

Manmade structures could impact fish and fisheries if they disrupt the critical habitat of a species. Offshore structures also can result in lost fishing space, time and gear, whereas onshore conflicts can result in competition between the fishing and oil and gas industries for berthing space and support services. It should be noted that lost fishing space, resulting in a decreased fishing effort, might, in fact, be beneficial to the fish themselves and result in an increased fish population. To increase our knowledge of these effects, BLM has contracted Centaur Associates, Inc. to conduct a study of space-use conflicts between the fishing and oil and gas industries both onshore and offshore (see Section I.B.4).

Several types of discharges and effluents could be released during OCS oil and gas activities. Of particular concern are drilling muds because very little is known about their long-term, chronic impacts (see discussion in Section IV.A.5-a).

Vessel traffic, particularly seismic boats, will cause some conflicts between the oil and gas industry and commercial fishermen.

Santa Barbara Channel. Since most oil remains at the surface, species which occur in the surface layer are the most vulnerable to impacts from oil. Many species have egg, larval and juvenile stages which inhabit the surface layer and are susceptible to oil. If a very large number of these stages were killed, the population would be significantly impacted. However: 1) the egg, larval and juvenile stages of most species occur over a much larger area than the oil would contact, 2) the oil spill may not occur at the time of year these stages occur in the surface layer and 3) even if the oil spill does occur during the time these stages are in the surface layer, the oil probably will not remain in the water in significant concentrations for very long, so that reproductive stages subsequently reaching the surface layer could survive. Nevertheless, the possibility that a population, at least for one year class, could be significantly impacted due to oil affecting the egg, larval or juvenile stages should be recognized.

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If numerous sexually mature animals are killed by oil, both the size and reproductive potential of the population will be directly reduced. Thus, species whose adult stages are concentrated near the surface at the time of the spill (e.g., Pacific bonito, jack mackerel, northern anchovy, California grunion) may be significantly impacted. There are too many variables to accurately predict these impacts, particularly in economic terms, but low to moderate ecological losses may occur (see definitions in Section IV.A.1.c). However, the California Department of Fish and Game reported no detectable ill effects on pelagic fish from the 1969 Santa Barbara oil spill (Mead and Sorensen, 1970).

Reduction in the population size of one species may significantly affect other species in the food chain. For example, many species feed on northern anchovies. If the number of anchovies is substantially reduced, their predators may need to switch to another food source, if available, to survive. Consumption of this new food source could affect its population size as well. Conversely, reduction in the number of anchovies means the population size of the species it feeds on could increase. The marine food web is extremely complicated and it is not possible to assess how significant the reduction of one species due to Sale No. 68 will be to others. However, the fact that population sizes are interrelated needs to be recognized. The complexity of the marine food web as it relates to management of multispecies fisheries is discussed by May, et al. (1979).

Losses also would occur due to a temporary reduction in fishing space and time. Mead and Sorenson (1970) calculated that the 1969 Santa Barbara oil spill caused a loss of $800,000 to the commercial fishing industry based on: 1) wages and profits lost by commercial fishermen over the 2-month period in which their operations were halted due to boom deployment across the harbor or their operations were made useless due to tainting, and 2) uncompensated damage to the commercial fishing fleet. Updating the 1969 value of $800,000 using the implicit price deflators prepared by the U.S. Bureau of Economic Analysis, the 1979 value of the economic impact of the Santa Barbara oil spill on commercial fishermen is $1.5 million. This estimate does not include property settlements paid by Union Oil to the fishing fleet since their values are unknown. The Santa Barbara oil spill was estimated to total between 780,000 bbl and 15,000 bbl, with the value of 75,000 bbl being felt by many to be the most realistic. Since there is a 39 percent probability of 0.5 spills of 10,000 bbl or greater from Sale No. 68 (see Section IV.A.1.a), losses similar to those caused by the Santa Barbara spill may occur over the life of the project if an oil spill forced closure of a port. Economic losses also would be incurred by associated support, processing, transportation and marketing industries. However, if fishermen are not held to port by oil spill containment booms, the losses will be less. Fishermen who normally fish the area where the oil spill is will need to fish a different area. This is not always possible, though, since the fishermen may not be familiar enough with other areas to avoid obstacles and find the fish, and because there may not be a large enough market demand for the fish they can catch in the other areas. Increased operating costs also may be incurred, particularly if the new area is farther away.

An oil spill could have a minor economic impact on kelp harvesters since oil may affect kelp survival (see Section IV.C.4) and because kelp traps oil rendering it unsuitable for harvest. However, the impact of the 1969 Santa Barbara oil spill on kelp harvesting was negligible because it was possible to reschedule the planned harvest to a later month of the year by which time oil in the kelp beds had been dispersed by natural wave action (Mead and Sorensen, 1970).

None of the mariculture industries are anticipated to be impacted since the probability of an oil spill reaching them is very low. However, if oil reaches mariculture operations, they would be impacted similarly to other commercial fisheries. The organisms would not be marketable due to tainting even if they lived through an oil spill. Equipment coated with oil would need to be replaced. Additionally, since they have less mobility than other fishermen, mariculture farmers could be forced out of business.

Losses from an oil spill also could occur to sport fisheries. It is not possible to quantify these losses, but there could be temporary economic impacts to operators of commercial passenger fishing vessels who rely upon sportfishing activities for their living, particularly if they are confined to port by oil containment booms or fishermen fish elsewhere due to adverse publicity of the oil spill.

Mitigation is provided by OCS Order No. 7 which requires that each oil company develop oil spill contingency plans and have ready access to pollution-control equipment and by oil spill cooperatives (see Section I.B.7.a). The other OCS orders are intended to reduce the likelihood of oil spills; however, these measures will not reduce the estimated losses noted above since these losses are based on the predicted number of oil spills over the life of the project. The Offshore Oil Pollution Compensation Fund was created to compensate for these and other losses (see Section I.B.7.b).

Manmade structures could impact fish and fisheries if they disrupt the critical habitat of a species. Disruption would be most likely during placement of a structure. Since the critical habitats of most species are not known, it is not possible to determine how significant this impact will be.

Offshore structures also can result in lost fishing space, time and gear. The fisheries most likely to have significant conflicts with offshore structures are the commercial trawl fisheries, but purse seining may have some conflicts (see discussion in Centaur Associates, Inc., 1980). Since most trawling within the Southern California Bight occurs in the Santa Barbara Channel, impacts from offshore structures will be greatest in this area. Surface structures such as drill ships or rigs, platforms, storage and loading systems and floating production systems will preclude fishing where they occur and in a surrounding buffer zone. The size of this buffer zone will depend on several factors including vessel maneuverability, fishing vessel operating characteristics, gear placement and control, effect of weather and sea conditions, legal and safety requirements, bottom topography (trawlers follow depth contours), a fisherman's experience and his willingness to fish near OCS structures. Additional fishing space could be lost to pursue seine fishermen if the platforms and associated subsea structures are close enough or arranged in such a manner that fishermen cannot maneuver their vessels between them. This should not present a problem to trawlers because turning radii of otter trawlers are typically of the same order of magnitude as the buffer distances (Centaur Associates, Inc., 1980).

Subsea structures also conflict with trawlers but do not conflict with purse seining except occasionally in shallow water (F70 m). Structures such as subsea production sytems and subsea completion systems preclude trawl space similar to surface structures. However, the buffer zone around these subsea structures will also be affected by the navigational accuracy with which a fisherman can know his position relative to the obstruction.

If fishermen know the location of offshore structures, they will avoid these structures unless there is good reason or financial pressure to fish close to them. In general, a minimum radius of 200 feet of fishing space will be lost around each surface structure, and 300 feet around each subsurface structure marked with a buoy that is located in Southern California (Centaur Associates, Inc., 1980). Other subsurface structures for which the locations are known, but not marked with a buoy, will preclude a minimum radius of 1,200 feet of fishing space due to navigational accuracy. Pipelines should not preclude fishing space other than at irregular surfaces since they usually are not avoided. In general, a maximum radius of 1,320 feet may be lost around all offshore structures if fishermen choose to observe the payment criteria of the Fishermen's Contingency Fund (see Section I.B.7.c), or during placement and maintenance of the structures. However, a mooring type of drillship could have anchors which extend an approximate distance of three to eight times the water depth of the well (although this will be in place for only a few months), and guyed tower platforms, if used, would preclude more fishing space than tension-leg or conventional platforms.

The total fishing area that will be precluded by OCS structures is very small. Multiplying the number of platforms (2), offshore storage and loading facilities (0), subsea production systems (0), floating production systems (0) and subsea completion units (0) predicted for the Santa Barbara Channel times the area that would be lost by a 1,320-foot radius buffer zone and dividing by the total Channel area included in the proposal (183,656 hectares) yields an 0.06 percent loss (101.6 hectares) in fishing area. These calculations do not account for space precluded by drilling ships and rigs, the heterogeneous distribution of fish populations and fishing effort, the tendency of trawlers to fish along depth contours nor the additional space that could be precluded from purse seining, particularly if the platforms are near one another or there is foul weather. Even when these factors are considered, the total fishing area lost will be very small, and there probably will not even be a detectable loss in catch. Nevertheless, these structures will be a nuisance to fishermen. At the same time, surface structures can provide benefits as navigational aids and emergency help in case a vessel is disabled or a crewman injured, and platforms could be used for mariculture operations. There is no doubt that production platforms and probably other offshore structures act as artificial reefs. However, this will most likely have a minor impact on most fish populations and may not benefit fishermen since oil companies generally discourage fishermen from anchoring or otherwise floating next to a platform.

It is important that pipelines be compatible with fishing because they often traverse a large area. OCS Order No. 9 requires that pipelines be installed and maintained to be compatible with trawling operations (see Section I.B.5).

How this is to be achieved will be decided for each case separately before the pipeline plan is approved (see Section I.B.7.g). When pipelines are buried, they usually create little conflict for fishermen. However, environmental conditions can cause these pipelines to become unburied, and nets can snag on valves, anodes or other irregular surfaces of unburied pipelines. In deep water or rocky bottoms it is unlikely that it will be feasible to bury pipelines. As pointed out by the proposed Wells and Pipeline Stipulation (see Section I.B.6.g), unburied pipelines will need to have smooth surface designs and some type of protection over irregular surfaces to be compatible with fishing gear. In Southern California, pipelines have had little conflict with commercial fishing until recently. The present conflict is not with the pipeline itself but mounds and trenches in the ocean floor created by anchors from the lay-barge when the pipeline was laid. Fishermen can no longer trawl the area because their nets hang up on these mounds and trenches. As required by OCS Order No. 9, the oil company plans to restore the area so it is compatible with trawling operations. However, it is not clear how this restoration can be accomplished. One possible solution, suggested by the local fishermen, is to pull a heavy chain over the area to level the bottom. In the future, this conflict may occur again when a pipeline is laid in a heavy clay soil. Use of a pull-barge instead of a lay-barge may prevent this conflict since the pull-barge has smaller anchors. Redesigning the lay-barge anchors also may prevent this conflict. However, if it is not possible to prevent similar conflicts in the future, impacts to the fishermen would be high, particularly if the pipelines are placed in important fishing areas.

Other subsea structures which potentially can cause significant conflicts are debris and temporarily abandoned subsea wellheads (also called temporary abandonments and casing stubs). Fishermen often do not know they exist and, therefore, they cannot avoid these objects. When fishermen know the location of the subsea structures, they may snag their nets while trying to catch the fish that are attracted to the structures. A snag on a subsea structure will usually result in lost fishing time and gear damage. Sometimes, the gear is totally lost or may need to be cut loose if it cannot be released. OCS Orders No. 1 and 3 require that the U.S. Coast Guard District Commander determine what aid to navigation devices are needed for subsea wellheads that are hazards to the deployment of commercial fishing devices. The proposed wells and pipeline stipulation require that subsea wellheads be protected, if feasible, to be compatible with commercial trawl gear. These measures reduce the conflicts. However, in Southern California, snags on subsea wellheads have occurred because the fishermen did not know these objects existed. Attempts have been made to provide the location of these structures, however, most fishermen navigate with Loran C coordinates and these typically have not been provided. In the future, information on the location of obstructions should be more readily available from the charts being prepared by National Ocean Survey (see Section I.B.7.c). Also, only about 2 percent of the exploratory wells will be temporarily abandoned compared to about 10 percent 5 to 10 years ago. In the past, more wells were temporarily abandoned and left in that state for many years because the oil companies felt it was necessary to do so to maintain their leases. This is no longer necessary and temporary abandonments probably will be only short term until development can proceed.

Nevertheless, one net may be lost on each temporarily abandoned subsea wellhead. Assuming 2 percent of the exploratory and delineation wells are temporarily abandoned and assuming total net loss (although the net may only be damaged), the loss over the life of the project including the cost of the lost fishing time is estimated to be $20,000 for the Santa Barbara Channel. The Fishermen's Contingency Fund will not compensate for these losses if the locations of the obstructions have been published or if the snag was due to the fisherman's negligence.

OCS Order No. 7 prohibits the disposal of any waste material which will adversely affect commercial fishing except under emergency conditions. However, since some materials will be dropped overboard, particularly in bad weather, minor impacts to commercial trawlers are likely to occur. OCS Order No. 1 requires that any equipment that could be expected to interfere with commercial fishing gear be marked, wherever practicable, with the owner's identification so that fishermen can seek compensation from the appropriate parties. If the responsible parties cannot be determined, the Fishermen's Contingency Fund usually will compensate for the losses (see Section I.B.7.c). However, applying for reimbursement from this fund places administrative burdens on the fishermen and compensation may not be received for several months.

Onshore, competition between the oil and gas industry and commercial fishing industry can occur for berthing spaces and services. The significance of these impacts will depend on the port. Centaur Associates, Inc. (1980) has conducted a study for BLM on port conflicts. They project that Port Hueneme can be expected to support a large percentage of onshore activity for the current leases because the available facilities have minimal development costs and OCS use is highly compatible with existing port uses. Presumably, some onshore activity from Sale No. 68 will occur at this port (see Section IV.A.2.a). Centaur Associates, Inc. also project that expansion of land use dedicated to the offshore industry at Port Hueneme should not have a negative impact on the fishing industry because existing berthing facilities will remain constant and dedicated to the fishing industry. Impacts may occur at fuel docks, fish and unloading facilities as a result of increased use of the harbor by OCS supply and crew boats. However, larger trawlers could enter the California fisheries in the future (Bybee and Richards, 1979). Since these trawlers probably would seek a deep-draft port such as Port Hueneme, conflicts between the fishing and oil and gas industries could increase.

Gaviota, Elwood Pier and Carpinteria Pier also may support some OCS-related onshore activity. Since these ports do not support fishing activities, conflicts should not occur. San Diego may receive a small percentage of the OCS-related port activity, primarily for highly specialized services, but this should have negligible impact on the fishing industry (Centaur Associates, Inc. 1980).

Several types of discharges and effluents could be released during OCS oil and gas activities. OCS Order No. 7 prohibits disposal of any waste materials into the ocean that will create conditions which will adversely affect aquatic life or commercial fishing. Disposal of waste materials is regulated by the Environmental Protection Agency. Of particular concern are drilling muds because very little is known about their long-term, chronic impacts. There are indications that these muds could produce elevated trace metal concentrations in marine organisms and interfere with reproductive processes (see discussion in Section IV.A.5.a). The impact that these elevated trace metal concentrations will have on fish and fisheries is unknown. Any potential impacts from drilling muds could be avoided if drilling muds and cuttings are barged out of the area or ashore.

Vessel traffic will cause some conflicts with commercial fishing boats. A minor impact will be caused by supply and crew boats since fishermen will need to maneuver around them if these vessels cut across the fishermen's intended path. In foul weather, additional vessels traveling through an area can become a significant hazard, particularly if they do not maintain safe speed levels. The greatest vessel conflicts probably will be with seismic boats. Fishermen have found that after a seismis boat passes through the area, sonar shows that the fish move to the ocean bottom and subsequently no fish are caught. How long the fish remain on the bottom is unknown. Additionally, seismic boats pull a 2-mile long cable behind them that precludes fishing in the area. This cable also can become entangled with stationery fishing gear, resulting in disruption and potentially loss of the (fishing) gear. This conflict could be reduced if the fishermen receive adequate notice of specifically where the seismic boats will be working so that the gear can be removed or its location can be clearly identified. If this conflict is not reduced, seismic boats may temporarily cause moderate impacts to the commercial fishing industry.

Inner Banks. If an oil spill occurred in this area, it would cause slightly greater losses than if it occurred in the Santa Barbara Channel since the Inner Banks encompasses the region's most productive fishing grounds and ports. Impacts from manmade structures will be much less than in the Santa Barbara Channel area since trawling in the Inner Banks area is very limited. Port conflicts also will be minor since the Los Angeles and Long Beach harbors are large, industrialized ports, and OCS activities are expected to continue to operate out of existing facilities (Centaur Associates, Inc., 1980). Discharges, effluents and vessel traffic will create impacts similar to those in the Santa Barbara Channel.

Outer Banks. Since the Outer Banks area is not close to any fishing ports, losses from oil spills due to port containment are unlikely. Otherwise, losses from oil spills in this area will be similar to those in the Santa Barbara Channel. An oil spill near Tanner and Cortes Banks probably would have the greatest impact on this area since these Banks are important biologically and they are prime fishing grounds.

Adverse impacts from manmade structures will be much less than in the Santa Barbara area since trawling in the Outer Banks area is very limited and the area is too far from shore for most sport fishermen. The four platforms and four SALM's projected for this area should not pose significant hazards to purse seiners, and because of the distance from shore these structures may be very useful to commercial and sport fishermen as navigational aids and places to obtain emergency help. Since there are no ports in this area, all onshore conflicts with manmade structures will occur in the other areas. Discharges, effluents and vessel traffic will create impacts similar to those in the Santa Barbara Channel.

Southern California Bight. The overall impacts to the Southern California Bight from Sale No. 68 probably will not be greater than the combined impacts to the subareas since the number of spills greater than 10,000 bbls over the 25-year life of the project is projected to be 0.5.

b. Other Alternatives: If the Marine Sanctuary Alternative is adopted, the impacts to the Santa Barbara Channel, Outer Banks, and Inner Banks could be slightly less than described above. Oil and gas activity farther from the Channel Islands will slightly decrease the likelihood that oil will reach the Channel Islands since there will be more time to deploy oil spill containment equipment. Therefore, species concentrated near the Channel Islands would be less likely to be impacted.

If the No Sale alternative is adopted, none of the adverse or beneficial impacts described above would occur. If the Delay the Sale alternative is adopted, the adverse and beneficial impacts would be delayed.

c. Conclusions (Alternative 1): Although there are too many variables to accurately predict impacts from oil spills, low to moderate ecological losses may occur to surface fishes (e.g., Pacific bonito, jack mackerel, northern anchovy, California grunion) and temporary economic losses may be incurred by the fishing industry. Impacts from oil spills probably would be greatest in the Inner Banks since this area encompasses the region's most productive fishing grounds and ports. Manmade structures could impact fish and fisheries if they disrupt the critical habitat of a species. It is not possible to determine how significant this impact will be. Mud mounds and trenches from the anchors of pipelaying barges probably will create a high impact to commercial trawlers in the Santa Barbara Channel unless a way is found to resolve this conflict. Other impacts from offshore structures are expected to be minor. No losses are anticipated from competition between the oil and gas industry and the fishing industry for berthing spaces and support services. The impact of trace metals in drilling muds on fish and fisheries is unknown. Vessel traffic, particularly seismic boats, may temporarily cause moderate impacts to the commercial fishing industry.

d. Cumulative Impacts (Alternative 1): The cumulative impacts of the proposed lease sale and other activities such as previous lease sales, natural oil seeps, sewage disposal and shipping will create additional stresses to fish and fisheries. Due to natural causes and existing activities, fish populations fluctuate dramatically and the additional stresses from the proposed Sale could increase the chance that fish populations would be significantly reduced. However, the impacts from the proposed Sale on fish populations probably will not be detectable since populations fluctuate so dramatically under existing conditions. Fisheries, particularly commercial fisheries, are subjected to many stresses that, in combination, severely impact the industry. Preclusion of trawling in prime fishing grounds, due to an oil spill, or mud mounds and trenches, or loss of gear due to seismic boats could cause high economic losses when combined with existing stresses.

6. Marine Mammals and Seabirds

a. Alternative 1: OCS oil and gas development has the potential to impact, in some cases very severely, marine mammals and seabirds. A lengthy discussion of impact types and their potential effects on marine mammals and seabirds can be found in the FEIS prepared for Sale No. 53. A summary of the oil spill impacts can be found in Section IV.A.1.a. The main agents which can impact marine mammals and seabirds are the physical presence of the drilling platform and the pollutants it has the potential to discharge, either in routine or episodic fashion. Pollutants that may be routinely discharged include drilling muds and cuttings, formation water, treated sewage, oil and noise. The volumes and probable sources of these pollutants are extensively discussed in Section IV.A.5.a. Service vessels and related support activities also have the potential to impact marine mammals and seabirds. Acting singly or in combination with one another, these impact agents may cause varying changes in physiology, reproduction, and behavior to the marine mammals and seabirds of the SCB. These changes can result in direct and indirect mortality.

i. Subarea Induced Impacts

Santa Barbara Area: If a spill should occur originating within the Santa Barbara Leasing Area, there is a maximum probability of 54 percent that the spill would strike Anacapa Island and the northern halves of San Miguel, Santa Cruz, and Santa Rosa Islands. These islands, particularly San Miguel and Anacapa, represent the largest year-round pinniped and seabird breeding colonies within the SCB. San Miguel Island normally supports between 40 and 60 percent of the total SCB population of California sea lions, with the remaining northern Channel Islands providing rookery space for much smaller populations. During one summer census in 1976, over 24,000 California sea lions were sighted on San Miguel, representing 58 percent of the SCB total (Dohl, et al. 1980). The northern elephant seal colony on San Miguel (10,681 animals in January of 1978, 85 percent of the SCB total) is the largest rookery in the species' range and generates over 80 percent of the total annual pup population in the Bight (Dohl, et al. 1980). San Miguel Island is also the only northern fur seal rookery outside of Alaska, thus, the only one in the SCB. The local population numbers approximately 4,000 animals, (Dohl et al., 1980). More than half of this SCB fur seal population is associated with the rookery during the summer breeding season. San Miguel Island also represents the sole hauling out area for Steller sea lions within the Bight. This species was rarely sighted during the survey of Dohl, et al. (1980) and is thought to be represented by only a few individuals off the Southern California coast. Harbor seals in the Bight are estimated to number approximately 3,000 individuals, with between 75 and 80 percent of the SCB population utilizing hauling out areas of the northern Channel Islands.

Regarding the nesting seabirds of the northern Channel Islands, Dohl, et al. (1980) noted that the predominant breeding species encountered in this area include:

- Cassin's auklet	>11,000 pairs on San Miguel; 135 pairs on Santa Cruz
- Western gull	2,500 pairs on Anacapa; 580 pairs on San Miguel; 321 pairs on Santa Cruz; 15 pairs on Santa Rosa
- California brown pelican	76-417 pairs on Anacapa; 80 pairs on Santa Cruz
- Brandt's cormorant	900-1,500 pairs on San Miguel; 200-700 pairs on Santa Rosa; 67-103 pairs on Santa Cruz; 1-2 pairs on Anacapa
- Ashy storm-petrel	300-1,000 pairs on San Miguel; 51 pairs on Santa Cruz
- Pigeon guillemot	450 pairs on San Miguel; >204 pairs on Santa Cruz; >125 pairs on Santa Rosa; 5 pairs on Anacapa
- Xantus' murrelet	75 pairs on San Miguel; 1 pair on Anacapa
- Pelagic cormorant	125-154 pairs on San Miguel; 60 pairs on Santa Rosa; 4-25 pairs on Santa Cruz; 1-2 pairs on Anacapa
- Double-crested cormorant	75 pairs on San Miguel; 3-15 pairs on Anacapa

Seasonally, this area is most vulnerable to a spill striking during the spring and summer months, a period when nesting seabirds and pinnipeds reach their highest numbers. Should a spill strike sensitive feeding and hauling out grounds during this critical period, moderate to high ecological losses (see Section IV.A.1.c. for definitions) to pinnipeds are anticipated. Northern fur seals, in particular, are extremely susceptible to heat and bouyancy losses as a result of contact with oil. Clean-up operations (i.e., human intrusion) into sensitive rookery areas could seriously affect resident populations of California sea lions, northern elephant seals, harbor seals, and Steller sea lions.

In the event that a spill strikes seabird feeding and nesting areas during critical breeding and fledging periods, moderate to high ecological losses (see Section IV.A.1.c. for definitions) are expected. Diving seabirds (cormorants, pelicans) are particularly susceptible to fouling by oil. Human intrusion due to clean-up activities may also adversely affect resident colonies.

The probability of a spill of greater than 1,000 bbl actually occurring and striking these areas, however, is less than 10 percent. Therefore, as a result of Sale No. 68 impacts, the expected ecological losses to the marine mammals and seabirds of this area should be low (see Section IV.A.1.c for definitions).

Inner Banks Area. Assuming a spill occurs, originating within the Inner Banks Leasing Area during the summer, it would have the highest probablity (18 percent) of striking Anacapa Island. Western gull (2,500 breeding pairs) and brown pelican (76-417 breeding pairs) populations on and near the island reach their highest numbers during late spring and early summer. Brown pelican fledglings, present during this period, are quite vulnerable to oil contamination. Diving seabird species are also susceptible to fouling of plumage after contact with floating oil. It is estimated that moderate to high ecological losses (see Section IV.A.1.c for definitions) to the seabirds of this area will result in the event that a spill occurs during the summer.

Assuming a spill occurs during the spring, Santa Catalina Island's eastern shore would be the most vulnerable. Maximum probabilities of a hit (12 percent) would occur if the spill originated from tracts 145 or 146. In the fall and winter, Santa Catalina's eastern shore is again the most vulnerable with probabilities of 17 and 12 percent, respectively, for hits from spills originating in the tracts to the east of the island. In the summer, the probability of oil striking Santa Catalina is less than 10 percent. The nearshore waters of the island, particularly to the south, represent an area of maximum seasonal concentration of SCB pilot whales and a major flyway for migrating seabirds (e.g. loons, Brant). In the event a spill strikes this area, low to moderate ecological losses (see Section IV.A.1.c for definitions) to these species would result. Other populations of seabirds and the marine mammals of the Inner Bank Area are not as vulnerable to the direct effects of a spill.

For spills of greater than 10,000 bbl, greater than 1,000 bbl, and 50 to 1,000 bbl, the probability of a spill actually occurring and striking one of these islands within 30 days is only 2 percent, 10 percent, and 13 percent, respectively. Therefore, as a result of Sale No. 68 impacts and the low probability of a spill occurring, the expected ecological losses to the marine mammals and seabirds of this area should be low (see Section IV.A.1.c for definitions).

Outer Banks Area. If a spill occurs originating within the Outer Banks Leasing Area, there is less than a 10 percent chance, for a given season, of it striking either San Nicolas, San Clemente, or Santa Barbara Islands. San Nicolas Island is the second largest pinniped rookery in the SCB (5,000-15,000 California sea lions; 200-2,500 northern elephant seals) and is characterized as a major seabird breeding site (Brandt's cormorant; western gull). To the north, the Santa Rosa Ridge area possesses the highest cetacean concentration in the SCB and represents a major migratory pathway for the large endangered baleen whales of the Bight. San Clemente Island has a sea lion rookery on its western shore (1,000-2,000 animals) and is a major nesting area for seabirds, including the endangered California brown pelican. Santa Barbara Island is a major breeding area for nine seabird species including possibly the world's largest colony of Xantus' Murrelet (1,000-5,000 breeding pairs) and the only U.S. nesting colony of the Black Storm-Petrel (60 breeding pair). In addition, Santa Barbara Island is important as a rookery and hauling out area for SCB pinnipeds (California sea lion; northern elephant seals). Nearshore waters for all three islands and the shallower portions of the Santa Rosa Ridge serve as important foraging areas for numerous species of seabirds and pinnipeds. In the event of a spill, moderate to high ecological losses (See Section IV.A.1.c for definitions) to these species are anticipated. Due to the low probability of a spill actually occurring, the expected ecological losses to the marine mammals and seabirds of this area resulting from Sale No. 68 impacts should be low.

Summary of Subarea Induced Impacts (Alternative 1). In the absence of an oil spill originating from Sale No. 68 activities, no significant changes in the marine mammal and seabird populations of the SCB are anticipated. In the event that a spill occurs and strikes either these species or their habitats, a variety of impacts are expected. Avifauna species whose habitats and foraging areas are primarily terrestrial should experience no impacts from Sale No. 68 activities. Species inhabiting or utilizing coastal and offshore areas of the SCB will be variably impacted, depending upon the nature and extent of the spill, the degree to which a given species utilizes the marine environment, the susceptibility of each species to oil contamination, and the season in which the spill occurs.

ii. Sale Wide Impacts by Species

aa. Pinnipeds

Northern Fur Seals. This species reaches its highest abundances in the SCB when the risks from an oil spill are the greatest. Fortunately, the majority of these animals are located at Adams Cove, on the southwest coast of San Miguel Island. Along this portion of the island, the risk from a spill is small (9 percent probability of a hit if a spill should occur). The minority segment of this population (1,300 animals) is located on Castle Rock, off the northwest side of San Miguel Island (NWAFC 1979). The greatest density of northern fur seals at sea is found south of the Channel Islands where the risk from an oil spill is low. Since northern fur seals depend heavily upon clean, unoiled fur for warmth, this species is extremely vulnerable to losses of insulation and bouyancy as a result of contact with oil and subsequent contamination of fur.

Should an oil spill strike either foraging or hauling out areas, a considerable number of animals would die. Ultimate responses of northern fur seals to direct exposure to oil pollution will vary depending upon factors such as toxicity of the oil and the degree of weathering prior to contact, population status at the time of the spill, season in which the spill occurs, and other sources of mortality. Low to moderate ecological losses are anticipated due to the variability of impacts and the low probability of a spill actually occurring and striking critical northern fur seal habitats.

Elephant Seals. Elephant seals may be especially vulnerable to oil when their pups are nursing. Nursing generally occurs from late January to early March. On San Miguel Island the majority of this species is found during breeding season on the western tip and southern sandy beaches. The majority of elephant seals of San Nicolas and San Clemente Islands are found on southwest facing beaches. Small numbers of elephant seals are also found on Santa Barbara and Los Coronados Islands. The risk of a spill to these areas is less than 10 percent. In the event that a spill occurs and strikes critical areas during nursing periods, moderate ecological losses (see Section IV.A.1.c for definitions) are anticipated. Due to the low probability of a spill occurring from Sale No. 68 activities, expected ecological losses should be low.

California Sea Lions. As with elephant seals, California sea lions may be more vulnerable to a spill while pups are nursing. Nursing of California sea lions in the Santa Barbara Channel usually occurs from May to early July. The majority of the pupping in the Santa Barbara Channel population occurs on the south side of San Miguel Island, with approximately 5 percent of all pupping occurring on Castle Rock. Relatively little California sea lion breeding activity occurs on the other northern Channel Islands and Santa Catalina. For the remaining (southern) Channel Islands, pupping does occur on the windward side of San Nicolas and San Clemente Islands. About 500 pups are born each year on Santa Barbara Island. The majority of the California sea lion pupping areas are in regions of low risk from an oil spill resulting from Sale No. 68. Therefore, due to the large population size, remote location, and limited seasonal vulnerability of this species, expected ecological losses to California sea lions should be low.

Harbor Seals. Harbor seals are born in April, May, or June. As with other pinnipeds, harbor seals may be more vulnerable to a spill while pups are nursing. Unlike other SCB pinnipeds, harbor seals breed and pup in large numbers on the leeward side of the Channel Islands, areas where the risks from an oil spill are the greatest. If a spill occurs, the probability of a spill striking a harbor seal pupping area during the summer months is 25 percent. However, the probability of a spill of greater than 1,000 bbl occurring and striking these areas (within 30 days) is only 10 percent. In the event of a spill, moderate ecological losses to local populations would occur. However, the probability of a spill of greater than 1,000 bbl occurring and striking these areas (within 30 days) is only 10 percent. Therefore, expected ecological losses to harbor seals should be low.

Guadalupe Fur Seals and Steller Sea Lions. Both species occur in the SCB in reduced numbers, with each local population totaling no more than 10 individuals. Neither the Guadalupe fur seal nor the Steller sea lion breed in the area. The risks to these animals as a result of Sale No. 68 activities are minimal and expected ecological losses should be low.

bb. Seabirds

Nesting Species. The SCB seabird nesting season can extend from January to August. During this period the probability of a spill striking an island where seabird nesting occurs is highest, 23 percent. However, the probability that a 10,000 bbl spill will occur and strike a seabird area is only 5 percent. The 1969 Santa Barbara oil spill was estimated to range between 25,000-75,000 bbl and it resulted in only a low ecological loss to seabirds (see Section IV.A.1.c for definitions). Therefore, the risk to seabirds from a Sale No. 68 spill is considered to be low.

Migrating Species. During the spring and fall migrations, 2.5 to 3 million birds migrate through the SCB, with different species using different areas of the Bight. As a consequence, a majority of the Southern California offshore area is utilized. Since only one spill of greater than 10,000 bbl is expected for Sale No. 68 over the 20-year projected life of development, the risk to migrating seabirds from a spill resulting from Sale No. 68 is low.

cc. Cetaceans: As with migrating seabirds, nonendangered cetaceans are widely distributed throughout the SCB. Northeastern long-finned pilot whales attain fairly high numbers in shallow waters to the southwest of Santa Catalina Island, an area of low oil spill potential. Pacific white-sided and common dolphins are common in the nearshore waters of San Miguel and Anacapa islands and along the Santa Rosa Ridge. Minke and pilot whales, along with several species of porpoise are frequently encountered along the eastern sill of the Santa Cruz Basin. Further south, near the Los Coronados Islands, common dolphins are seasonally abundant. Along the mainland coast, bottlenose dolphins and pilot whales are seasonally abundant off Pt. Vincente (Santa Monica Basin, eastern margin); common dolphins also exhibit high seasonal concentrations between San Clemente and Dana Point. The risk to nonendangered cetaceans from the activities of Sale No. 68 is expected to be low, due primarily to the low probabilities of a spill occurring.

b. Other Alternatives: Adoption of Alternative 2 will reduce the potential impacts to the marine mammals and seabirds which inhabit the northern Channel Islands area. The expected ecological losses noted in the previous section would be slightly reduced in the event of a spill striking critical foraging and breeding areas. The additional 3-mile buffer zone would provide for increased response time in the event of a spill. Overall the expected ecological losses cited in the previous section remain essentially unchanged as a result of this alternative.

A cancellation of the Sale (Alternative 3) would eliminate the risk of potential Sale No. 68 impacts to marine mammals and seabirds of the SCB. However, even without the Sale oil spill risks are high due to existing activities. The risk of a spill would increase should oil have to be imported into Southern California to replace the expected resources from Sale No. 68.

A delay in the proposed Sale (Alternative 4) would simply delay the risk of impacting marine mammals and seabirds of the SCB, assuming no additional oil is imported as a consequent of the delay.

c. Conclusions (Alternative 1): Based upon the oil spill hit probabilities, species vulnerabilities, locations and sizes, and numerous other factors, the marine mammals and seabirds are generally expected to sustain only minor impacts. More precisely, low ecological losses are anticipated for elephant seals, harbor seals, Guadalupe fur seals, California sea lions and Stellar sea lions. Note, however, that moderate ecological losses could be sustained by elephant and harbor seals if their nursey areas were oiled. The probibility of this happening is low. Northern fur seals are expected to sustain moderate to low ecological losses. None of the cetaceans in the SCB are expected to incur more than a low ecological loss.

Seabirds, both those which nest and migrate in and through the proposed Sale area, are expected to suffer low ecological losses. Nesting occurs between January and August, while migrating species pass through the Bight in the spring and fall. Therefore, regardless of the season a spill occurred, seabirds will be deleteriously impacted.

d. Cumulative Impacts (Alternative 1): The potential impacts from proposed Sale No. 68 are minor compared to the cumulative impacts of the proposal plus existing sources. From cumulative sources there are 12 expected spills greater than 10,000 bbl, over the life of the project. When this is combined with over 50,000 metric tons of oil and grease discharged annually through Los Angeles County's municipal sewage system, it is likely that all species of pinnipeds could sustain at least moderate ecological losses. Northern fur, elephant and harbor seals would probably be the most severely impacted. All three of these species could suffer high ecological losses. Cetaceans are not likely to suffer more than a low ecological loss. Seabirds, however, can be expected to experience moderate to high ecological losses. Those species which would probably be hardest hit would be diving seabirds, such as cormorrants and pelicans.

7. Endangered and Threatened Species

a. Alternative 1

i. Summary of Impact Agents (see Section (IV.C.6.a.i)

ii. Subarea Induced Impacts

aa. Santa Barbara Area Leasing Impacts: If a spill occurs and strikes area #1, 2, or 3 (see Table IV.C.7-1), the impact would result in a high ecological loss (see Section IV.A.1.c for definitions). If a spill occurs and strikes either area #4 or 5, the magnitude of the impact on endangered species would depend upon the season in which it struck. Brown pelican fledglings are considered to be very vulnerable to oil during the spring and summer; gray whales are present as migrants in the SBC area from December through March. In the event that a spill occurs during these periods, ecological losses to brown pelicans would be high; ecological losses to the gray whale are indeterminable. The low probability of a spill and the seasonal presence of many of these species in the Santa Barbara Channel area lowers the potential risk to the endangered species subject to impacts from Sale No. 68 activities.

bb. Inner Banks Area Leasing Impacts: If a spill should occur and strike any of the first six areas listed in Table IV.C.7-2, a high ecological loss is expected (see Section IV.A.1.c. for definitions). In the event of a spill, ecological losses to brown pelican fledglings of the Anacapa Island area (area 7) would be high during spring and summer. The bald eagle population of Santa Catalina Island would experience low ecological losses should a spill occur within the Inner Banks area and strike area 8. The ecological losses to gray whales migrating through the coastal offshore area (area 9) following a spill are indeterminable.

cc. Outer Banks Area Leasing Impacts: If a spill should occur from tracts in the Outer Banks area, the probability of it striking Santa Barbara, San Clemente, and San Nicolas Islands are 14 percent, 13 percent, and 22 percent, respectively. Santa Barbara and San Clemente Island serve as important foraging and intermittent breeding areas for the California brown pelican. The shallow waters surrounding these three islands are used extensively by this species and other foraging seabirds, as well as by non-endangered pinnipeds. In the event of a spill occurring and striking these islands, endangered populations would suffer moderate to high ecological losses. If a spill occurs near the Tanner Banks area there is a 100 percent chance of it hitting the Tanner Banks, a region continually frequented by foraging seabirds and endangered whales. The probability of a spill of greater than 1,000 bbl actually occurring and striking one of these four areas within 30 days is 4 percent, 5 percent, 3 percent, and 3 percent, respectively. Therefore, the risk to endangered species in the Outer Banks area is considered to be low.

TABLE IV.C.7-1

ESTIMATED RISK TO ENDANGERED SPECIES FROM SANTA BARBARA AREA LEASING

Area	Conditional Probability of a hit w/in 30 days	Probability of a spill (>1000 BBL) occurring and striking the area	Species Affected
(1) Santa Ynez River Mouth	26%	Less than 0.5%	Least tern
(2) Goleta Slough	30%	4%	Light-footed Clapper Rail; Belding's Savannah Sparrow; Salt-marsh Bird's Beak
(3) Carpinteria Marsh	100%	5%	Light-footed Clapper Rail; Belding's Savannah Sparrow; Salt-marsh Bird's Beak
(4) Anacapa Island	26%	5%	Brown Pelican
(5) Santa Barbara Channel	100%	10%	Gray Whale

TABLE IV.C.7-2

ESTIMATED RISK TO ENDANGERED SPECIES FROM INNER BANKS LEASING AREA

Area	Conditional Probability of a hit w/in 30 days	Probability of a spill (>1000 BBL) occurring and striking the area	Species Affected
(1) Carpinteria Marsh	24%	5%	Light-footed Clapper Rail; Belding's Savannah Sparrow; Salt-marsh Bird's Beak
(2) Mugu Lagoon	26%	1%	Light-footed Clapper Rail; Belding's Savannah Sparrow; Salt-marsh Bird's Beak; Least Tern
(3) Bolsa Chica and Anaheim Bay	68%	2%	Light-footed Clapper Rail; Belding's Savannah Sparrow; Salt-marsh Bird's Beak; Least Tern
(4) Upper Newport Bay Santa Margarita River	100% 30%	3% 3%	Light-footed Clapper Rail; Belding's Savannah Sparrow; Salt-marsh Bird's Beak; Least Tern
(5) San Diego Co. Lagoons	21%	4%	Light-footed Clapper Rail; Belding's Savannah Sparrow; Salt-marsh Bird's Beak; Least Tern
(6) San Diego Bay and Tijuana Estuary	10%	2%	Light-footed Clapper Rail; Belding's Savannah Sparrow; Salt-marsh Bird's Beak Least Tern
(7) Anacapa Island	33%	5%	Brown Pelican
(8) Santa Catalina Island	30%	10%	Bald Eagle
(9) Coastal Offshore Area	100%	10%	Gray Whale

iii. Combined Impacts (Species Accounts)

Birds. Potential impacts from Sale No. 68 pose the greatest threat to birds that are closely associated with the water. Species such as the American peregrine falcon, California condor, San Clemente loggerhead shrike, San Clemente sage sparrow, and the Santa Barbara song sparrow (if still extant) are not likely to be impacted by OCS oil and gas development. Habitats for these species are primarily terrestrial areas which are not likely to experience impacts from this or other OCS lease sale activities. The southern bald eagle, a successful recolonizer at Santa Catalina Island, may be impacted during a spill since it is known to forage along the coastline. Potentially impacted species would include the California brown pelican, California least tern, light-footed clapper rail, Belding's savannah sparrow, and the black rail. If a spill should occur and strike either nesting or foraging areas, these species would be heavily impacted. Because of the low probability of a spill actually occurring and striking either these species or their habitats, few impacts are likely to be experienced by the threatened or endangered bird species of the SCB.

Mammals. If a spill occurs, there is less than a 10 percent chance of oil from Sale No. 68 activities striking a portion of the southern sea otter's range. Although the world population of nearly 2000 animals is distributed primarily along the central California coast between Monterey Bay and Pismo Beach, a few sea otters are observed annually in the SBC. These few animals are not expected to be severely impacted by the one spill projected from Sale No. 68.

The island fox, listed by the State of California as a rare animal, is found on all SCB islands except Anacapa and Santa Barbara. This species is not likely to be impacted from activities resulting from lease Sale No. 68 since its habitat is terrestrial.

Of the seven endangered whale species that are found within the Bight, the gray whale is considered the most vulnerable to the potential impacts from lease Sale No. 68. The gray whale is a frequent (bi-annual) visitor to the SCB, is found in large numbers, and frequents nearshore areas associated with oil and gas development. The gray whale is potentially vulnerable to ingestion, inhalation, and epidermal contamination as a result of contact with oil, although the degree of impact from these factors is currently unknown. Noise pollution is a factor suggested by some to cause the gray whale to alter its migratory route, although this hypothesis was not supported by Dohl (1978) in his three-year study of cetaceans of the SCB; noise pollution and offshore disturbances have been increasing concurrent with the increases in gray whale population numbers. Recent sightings of gray whales in more distant offshore areas have been attributed to increases in population numbers, not increased OCS activity (Dohl et al. 1980). The low probability of a spill from lease Sale No. 68 and the gray whale's seasonal presence within the SCB are factors that minimize this species' risk to impacts from Sale No. 68 activities.

The other endangered whale species are less likely to be impacted than the gray whale since individuals of these species are less abundant and utilize more distant offshore regions of the Bight. Assuming that a spill occurs, endangered baleen whales (e.g. blue, fin, humpback) could accidentally ingest oil while feeding, thereby fouling their baleen plates. Other baleen whales, such as right and Sei whales which skim the water surface, may be the most vulnerable of the baleen feeders. The effects of oil ingestion on cetaceans are unknown. Overall, the risk to the endangered whale species of the SCB is considered to be low due to the low probability of an oil spill occurring as a result of Sale No. 68 activities.

Reptiles. Sightings of endangered sea turtle species within the southern California Bight are rare, being restricted to San Diego and Long Beach harbors (Jim Lecky pers. comm.). These migrant individuals are not part of a resident breeding population and are not likely to be impacted by Sale No. 68 activities.

The San Clemente Island night lizard, a terrestrial species, should not be impacted by the activities of this sale.

Insects. The two mainland endangered butterfly species, the El Segundo blue and the Palos Verdes blue, are not likely to be impacted by Sale No. 68 activities since both species are strictly terrestrial.

Vema hyalina. Vema hyalina (McLean 1979), a monoplacophoran limpet recently proposed as an endangered species, has been encountered only on the southern segment of the Santa Rosa-Cortes Ridge, northwest of Tanner and Cortes Banks. To date, collection of Vema has occurred only at depths between 174 and 402 m (571-1319 feet) on rocky cobble substrates (Lowenstam 1978; McLean 1979). A more detailed discussion of the importance of this species can be found in Section III.B.2.b.

Due to its limited depth range and restricted distribution, Vema is considered to be exceptionally vulnerable to impacts from oil and gas exploration and development within close proximity to its habitat.

Plants. The salt-marsh bird's beak is found in the coastal saltmarshes of Southern California, normally at or near the high tide line. The impact of Sale No. 68 activities on this species should be low unless spilled oil strikes a marsh area and is deposited during high tide.

b. Other Alternatives: Deletion of complete and partial tracts lying within the proposed marine sanctuary (Alternative 2) will reduce the potential impacts to the endangered and threatened species which frequent the area. The additional 3-mile buffer zone will provide for increased response time in the event that a spill occurs. Assuming this alternative is adopted, the expected ecological losses estimated in the previous section would be slightly reduced in the event of a spill striking sensitive breeding and foraging areas.

A cancellation of the Sale (Alternative 3) would eliminate the risk of potential Sale No. 68 impacts to endangered and threatened species of the SCB. However, even without the Sale oil spill risks will remain high due to existing activities. The risk of a spill would significantly increase should oil have to be imported to replace the expected resources from Sale No. 68.

A delay in the proposed Sale (Alternative 4) would simply delay the risk of impacting endangered and threatened species of the SCB, assuming no additional oil is imported as a consequence of the delay.

c. Conclusions (Alternative 1): In the event a spill occurs and strikes either these species or their habitats, a variety of impacts are expected. Endangered species whose habitats and foraging areas are strictly terrestrial should experience no impacts from Sale No. 68 activities. Species inhabiting or utilizing coastal and offshore areas of the Bight will be variably impacted, depending upon the nature and extent of the spill, the degree to which a given species utilizes the marine environment, the susceptibility of each species to oil contamination, and the season in which the spill occurs.

d. Cumulative Impacts (Alternative 1): The description of cumulative impacts as cited in Section IV.C.6.d are also applicable to this section. The potential impacts to the endangered and threatened species of the SCB are significant. The combined effects of Sale No. 68 and existing operations are anticipated to continue to stress the endangered and threatened species of the SCB.

8. Sensitive Biological Areas

a. Estuaries and Wetlands

i. Alternative 1: Estuaries, bays, and marshes are critically important biologically. Estuaries are not as large or numerous in Southern California as they are in some other portions of the United States. Much of the estuarine environment has been severely altered or destroyed. It is essential, therefore, to preserve the remaining unaltered areas if species dependent upon these estuaries for breeding, nursery areas, or during their entire life cycle, are to survive in Southern California.

The intertidal organisms reported killed during the Santa Barbara blowout were able to repopulate the impacted intertidal because of large populations at surrounding nonaffected areas (Straughan, 1971). More rare species with a very narrow and limited reproductive range could conceivably have become eliminated from the Southern California region. Because of the rarity of estuaries in the lease area, a similar situation is possible with certain estuarine species. Several species use bays for nursery areas (California halibut and Pacific staghorn sculpin). Other species, both invertebrates and vertebrates, are important permanent residents of bays (Ho, 1974). Further destruction of estuaries in Southern California will increase the probability that estuarine affiliated species will be entirely eliminated from the coast because of the elimination of nursery grounds and habitat destruction.

A more complete discussion of oil impacts on estuaries can be found in Pacific OCS Sale Nos. 35, 48, and 53 (Department of the Interior 1975, 1978a, 1980). The impact agents of concern from oil development will be spilled oil. Other impact agents are unlikely to affect estuaries in this case.

Impacts expected for Southern California estuaries are somewhat hard to forecast because most of the historical information comes from other areas and has involved varying fuel oil toxicities. According to Bender, et al. (1977) and others, however, severe impacts have been documented when crude oil is spilled on estuarine habitats. In the event of a large spill, which completely covers the surface and the flats of the lagoon, and remains for several days, destruction could be manifested for over 10 years. Some species, if endemic, may be permanently elminated. Artificial restocking of the habitat may also be necessary.

According to Gundlach and Hayes (1978), estuarine salt marshes and mangroves, followed closely by sheltered tidal flats, such as occur in an estuary, are the most susceptible habitats to oil contamination.

It becomes clear that it is very important to prevent an oil spill from entering an estuary, particularly during a large spill. There is a greater probability of accomplishing this by diverting oil away from the entrance before the oil slick reaches it than by containing the slick just outside the bay by placing a mechanical barrier (e.g., boom) across the estuary mouth. Diversion of an oil spill away from an estuary may cause the oil to end up at an adjacent intertidal area; however, adjacent intertidal areas may also be important. Oil dispersants may be of use in reducing the size of the slick which could enter an estuary. Oil cleanup methodology is discussed further in Section IV.A.1.b.

How successful will the diversion-containment operations be in Southern California? Many variables are involved in the success or failure of this approach, since the conditions that make boom equipment ineffective are only known in a general way. The physical conditions under which diversion equipment is no longer effective are: water current velocity greater than 1 knot (1.69 ft/sec), surface wind velocity greater than 30 mph, or wave height of six feet or greater. Little nearshore current velocity data is available. Coastal wind velocities of 30 mph are infrequent, occurring less than 1 percent of the time. Data are available for wave heights which is one of the more important physical parameters.

The frequency of waves greater than 1.8 m (6 feet), expressed as significant wave height probabilities, is shown in Table IV.C.8.a.i-1. Significant wave height is the average height of the one-third highest waves in a wave record. The two sets of data in the table reflect deep water waves at the northern and southern extremes of the Bight and nine coastal stations located throughout the Bight. Since it is the most desirable to divert an oil slick before it has moved close to an estuary entrance, the wave heights most likely (at least hopefully) encountered by diversion equipment during a spill are probably somewhere between the deep water waves and coastal waves shown in the table. Based upon this assumption, oil diversion equipment will be ineffective between 0.1 and 58 percent of the time. Most commonly, this figure is between 1 and 29 percent. The most effective diversion period is during the early winter (over 90 percent effective) while the least is early summer (from 42 percent to 60 percent effective).

Since the openings to estuaries and the protective ability of oil containment-diversion equipment is highly variable, it is necessary to generalize when discussing potential impacts of oil spills on estuarine habitats. With the use of conventional containment-diversion techniques, it is assumed that estuary openings of greater than 100 meters are extremely difficult to protect once oil approaches the mouth. The approximate widths of the entrances of estuaries are shown in Table III.B.7.a-1 which indicates that Anaheim Bay, lower Newport Bay, Mission Bay, and San Diego Bay have widths greater than 100 meters. During certain periods of the year (winter) it might be possible for nine additional estuaries to have entrances of greater than 100 meters. The breakwater opening and channel entrance to Anaheim Bay are each less than 200 meters wide and would probably allow additional diversion capabilities (BLM personnel observations). According to Baker (personal communication) the entrance to Mugu Lagoon very often becomes greatly expanded during wet winter months. A large spill entering an estuary would most probably cause a high ecological loss requiring over ten years for recovery.

Containment abilities will most probably range from about 40 to 99 percent effective with early winter being the most effective and early summer being

TABLE IV.C.8.a.i-1

PROBABILITY OF WAVES GREATER THAN 6 FEET (1.8 m) AT SOUTHERN CALIFORNIA BIGHT LOCATIONS BASED ON SIGNIFICANT WAVE HEIGHTS

Source: Williams, et al. (1980)

Location	Time Period	Wave Probability
A. Deep Water		
1. Point Conception (33.5°N, 120.4°W)	Annual	23%
	Max. Month - May	44%
	Min. Month - December	8%
2. Mexican Border (33.5°N, 120.4°W)	Annual	29%
	Max. Month-June	58%
	Min. Month-December	9%
B. Coastal Locations		
1. Point Hueneme	Annual (1961-1964, 1977)	1% & 4%
2. Point Mugu	Annual (1973-1974)	2%
3. Venice	Annual (1966)	0.1%
4. Huntington Beach	Annual (1972-1974)	0.5%
5. Oceanside	Annual (1977)	0.5%
6. Scripps Pier	Annual (1977)	0.5%
7. Ocean Beach	Annual (1977)	5%
8. Imperial Beach	Annual (1977)	0.1%

***TABLE IV.C.9.a.i-1**

the least. The relatively small openings of most estuaries in Southern California, and the relatively high ability to divert a spill (particularly during the winter when many estuaries have their widest openings), makes the actual entrance of oil into them a relatively small probability.

According to the oil spill model, only one mainland segment (Number 31) has a 5 percent or greater probability of receiving a greater than 1,000 barrel oil spill within 30 days. The estuaries involved in this section, located in Ventura County, are the Santa Clara and Ventura river estuaries and Carpinteria Marsh, containing the endangered light-footed clapper rail and Beldings savannah sparrow. According to Table III.B.7.a-1, Ventura and Santa Clara Rivers are usually closed and Carpenteria Marsh has an extremely small opening. Under extreme winter conditions, the openings of the two rivers may enlarge to nearly 10 m (approximately 30 feet) and the marsh to 30 m (98 feet). Table IV.C.8.a.i-1 indicates booms may be able to divert oil from the entrances 92 to 56 percent (minimally) of the time, with the maximum diversion efficiency occurring during the winter (Williams, et al. 1980) when the entrances usually are their widest.

Because of the relatively narrow openings of the three estuaries within Segment 31 and the periods when oil diversion equipment will be operable, the probability of oil entering these estuaries during a spill is low. If we consider that the spill entering the estuary is close to 10,000 barrels, the biological impacts on the estuary will be high (Section IV.A.1.c).

ii. Other Alternatives: The elimination of 13 complete and 23 partial tracts in Alternative 2 should have no significant change on the impacts of estuaries and wetlands. Cancelling the Sale would eliminate potential impacts while the Delay Alternative would postpone potential impacts.

iii. Conclusions: If a large oil spill were to enter an estuary, a high ecological loss would almost certainly result. The chance of a spill entering an estuary, however, is small. Exceptions to this may be several estuaries, discussed in Section IV.C.8.a which have wide mouths, at least during winter periods.

iv. Cumulative Impacts: The oil spill model for oil and gas development cumulative impacts indicates that 85 percent (11 of 13) of the 26-mile land segments have a 5 percent or greater probability of a hit with a large (greater than 10,000 bbl) oil spill within 30 days. As a worse case analysis, this section will consider those estuaries having a probability of at least 10 percent of a hit with a large oil spill (greater than 10,000 barrels). These estuaries and their hit probabilities are:

Goleta Slough	31
Carpinteria Marsh	20
Santa Clara River	20
Ventura River	20
Anaheim Bay	59
San Luis Rey River	12

Agua Hedionda River	12
Santa Margarita River	12
San Mateo Creek	12
San Elijo Lagoon	12
Buena Vista Lagoon	12
Los Penasquitos Lagoon	12
Batiquitos Lagoon	12

There is a high probability of a high ecological loss if a large oil spill were to enter an estuary.

The Alternative 1 section of the estuaries and wetlands impacts summarizes the relatively good ability to prevent a spill from entering most estuaries within the Sale area.

There are only three relatively unaltered estuaries remaining within Southern California: Mugu Lagoon, Anaheim Bay, and Tijuana Estuary. The rest have already undergone a high ecological loss, primarily from development projects, and are not likely to be allowed to recover within the next 25 years. Of greater interest to the ecology of the Bight is whether the remaining three unaltered estuaries be allowed to remain so, and will there be significant recovery allowed in the others. Or, will they continue to be degraded? Present intentions and rules protecting estuaries may fall to development pressures within the next 25 years due to increased property value or changing public attitudes. Most of these decisions will be unaffected by OCS development.

b. Marine Reserves, Refuges, and Areas of Special Biological Significance

i. Alternative 1: The Marine Reserves, Refuges, and Areas of Special Biological Significance are designations intended primarily to protect intertidal and shallow water subtital habitats. Consequently, the impacts from oil spills on these habitats are found in Sections IV.C.3-7 (particularly IV.C.4) and will not be covered further here. Much the same is true with the Biologically Sensitive or Unique Areas not covered by other categories (Table III.B.7.b-1); their coverage can be found in the same sections.

Since any spills reaching an Area of Special Significance, and to a lesser extent Ecological Reserves and Marine Refuges, is considered to be harmful, a violation, the maximum probability, i.e., a small spill (50 to 1,000 barrels), predicted by the oil spill model was used for analysis. Those sensitive areas having a 5 percent probability of a hit within 30 days are shown in Table IV.C.8.b.i-1. The inner banks have thirteen sensitive areas having a 5 percent probability of a hit, and the outer banks have five such sensitive areas, while the Santa Barbara area has one or two with Santa Rosa Island counted twice.

ii. Other Alternatives: Due to these special considerations given the marine sanctuary and the islands, the question becomes, will the adoption of Alternative 2 reduce any damage or pollution to the sanctuary?

TABLE IV.C.8.b.1-1

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE, RESERVES AND OTHER SENSITIVE AREAS HAVING A 5 PERCENT OR GREATER PROBABILITY OF AN OIL SPILL HIT WITHIN 30 DAYS

Significant Areas	50 to 1,000 BBBL Prob. (%)	1,000 to 10,000 BBL Prob. (%)
Segment 35		
Bolsa Chica Ecol. Reserve	6	2
Seal Beach Natl. Wildl. Refuge	6	2
Segment 36		
Irvine Coast Mar. Refuge	7	3
Laguna Beach Mar. Refuge	7	3
South Laguna Beach Mar. Refuge	7	3
Niguel Marine Refuge	7	3
Dana Point Marine Refuge	7	3
Doheny Beach Marine Refuge	7	3
Newport Beach Marine Refuge	7	3
Heisler Park Ecol. Reserve	7	3
Segment 38		
Buena Vista Lagoon Ecol. Res.	8	4
San Diego Marine Refuge	8	4
Segment 39		
La Jolla Ecol. Reserve	5	2
Santa Rosa Island ASBS	7	3
Santa Cruz Island ASBS	17	6
Anacapa Island ASBS	13	5
San Nicolas Island ASBS	7	4
Santa Barbara Island ASBS	6	4
Santa Catalina Island ASBS	16	13
San Clemente Island ASBS	15	8
Tanner-Cortes Banks	17	10

The advantages to the sanctuary by omitting the tracts are:

(1) Elimination of platforms and the resulting drilling muds-cuttings, etc., within the boundary.

(2) Increase in the length of time it would take an oil spill to reach the islands and shallow waters of the sanctuary.

The minimum amount of time that will be gained is 4 to 5 hours. Most often, the amount of time required to reach shore, by increasing the buffer from 3 to 6 miles, will be much greater. Oil becomes less toxic over time, through weathering, and tends to dissipate. Adoption of Alternative 2 could reduce the toxicity and the amount of oil reaching shore. Perhaps even more important is the increased time available to contain or divert the oil away from this biologically and politically significant area. Further, the physical characteristics of Southern California seas are fairly good for handling an oil spill (See Section IV.C.8.a.i). The additional time and distance allowed to accomplish this could often make the difference between oil reaching or not reaching the shore, and shallow nearshore waters of the sanctuary.

In short, eliminating the areas in Alternative 2 will increase the ability to prevent a high impact in terms of the significant legal designations ASBS, National Park, and Marine Sanctuary.

iii. Conclusions: The formation of the legal and biologically significant areas is based upon biological factors. These factors are discussed under the appropriate sections. There is a high probability that at least one of the areas of special biological significance covered in this section (Table IV.C.8.b.i-1) will be hit with an oil spill as the result of this Sale.

iv. Cumulative Impacts: The oil spill model indicates that for cumulative spill probabilities from all existing and proposed oil and gas development, 85 percent (11 of 13) of the 26-mile land segments have a 5 percent or greater probability of a hit with a large oil (over 10,000 barrel) spill within 30 days. With only one exception (Mugu Lagoon to Latigo Point), every ASBS has a 5 percent or greater probability of receiving a hit with a small (500 to 1,000 barrel) oil spill. Table IV.C.8.b.iv-1 shows the sensitive areas listed in Table III.B.7.b-1 which have a 25 percent or greater probability of receiving a small (50 to 1,000 barrel) oil spill within 30 days. This separates out those areas which will definitely be prone for a spill. The areas which have a high probability for a small spill hit also have a high probability for a larger hit, over 1,000 bbl. The probabilities, in fact, decrease relatively little. Six of the sensitive areas are in the inner banks Sale area, four are located in the outer banks, while two to three (counting Santa Rosa Island twice) are located in the Santa Barbara area.

The effect other projects have on special significant areas depends upon how well present laws and intentions are followed. The Areas of Special Biological Significance are so valuable that they cannot withstand any human-induced alterations. The Refuges, Reserves, and Preserves are to maintain healthy intertidal and low subtidal areas and preserve good fishing. If these ideals are followed for the next 25 years, most of the areas should remain in relatively unaltered condition, barring catastrophies such as multiple oil spill hits.

TABLE IV.C.8.b.iv-1

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE, RESERVES AND OTHER SENSITIVE AREAS HAVING A 25 PERCENT OR GREATER PROBABILITY OF AN OIL HIT WITHIN 30 DAYS FROM ALL OIL AND GAS ACTIVITY IN THE BIGHT

Significant Areas	50 to 1,000 BBL Prob.	Over 1,000 BBL Prob.
Bolsa Chica Ecological Reserve	99.5+	92
Seal Beach Natl. Wildlife Refuge	99.5+	92
Buena Vista Lagoon Ecological Res.	30	22
San Diego Marine Refuge	30	22
San Miguel Island ASBS	61	55
Santa Rosa Island ASBS	58	46
Santa Cruz Island ASBS	88	77
Anacapa Island ASBS	66	56
Santa Catalina Island ASBS	61	47
San Clemente Island ASBS	29	21
Tanner-Cortes Banks		

9. Marine Sanctuaries

a. Alternative 1: The Channel Islands National Marine Sanctuary is the only marine sanctuary in California that is likely to be impacted by proposed Sale No. 68. The most vulnerable resources within the Sanctuary are seabirds, pinnipeds, intertidal and subtidal benthic organisms. These resources are expected to sustain low to moderate ecological losses as a result of the Sale. Diving seabirds (like the cormorrant) and fur seals (like the northern fur seal) are the most vulnerable. For a more specific discussion, see Sections IV.C.4, 6 and 7. Minor impacts to recreational boating, fishing, diving and cultural resources could also occur.

b. Other Alternatives: Alternative 2 will decrease the risk to resources within the Sanctuary. Deleting the tracts within 6 nm of the islands will increase the time required for spilled oil to reach shore by at least 4 to 5 hours, possibly by as much as 10 hours. During this time, a significant amount of evalporation, dissolution and weathering of the oil would occur, reducing the quantity and toxicity. Also, it would allow more time for oil spill cleanup and containment equipment to be mobilized. The oceanographic conditions off Southern California are fairly good for handling an oil spill. With this additional time, the chances of effectively protecting sensitive marine resources are greatly increased.

Specifically, the seabird, pinniped and benthic resources would be less likely to be directly contacted by the oil. Even if the oil did reach these resources, there would be less of it; it would be more weathered; and it would be less toxic.

Increasing the distance between OCS development and these resources would also reduce the vessel traffic, human intrusion and noise generated during exploration and development. Potential disruption of critical breeding and nesting activities for seabirds and pinnipeds would, therefore, be reduced. Also, the risk of damage from platforms and pipelines, to hard bottom subtidal areas, would be eliminated. Lastly, deleterious effects from drilling muds, cutting and formation water would be greatly reduced.

Potential impacts to recreational boating, fishing and diving within the Sanctuary will be reduced by adopting Alternative 2. Cultural resources will not be subjected to the jeopardy of exploration and development activities (see Section IV.C.19).

It is important to note that these unusual and valuable resources (intertidal, subtidal benthos, pinnipeds, seabirds, recreational and cultural) were major reasons the area was designated as a National Marine Sanctuary and a National Park. Adopting Alternative 2 (deleting tracts within the Sanctuary) would help maintain the characteristics and qualities that were prime reasons for designating the Northern Channel Islands as a National Marine Sanctuary and a National Park.

Cancelling the Sale (Alternative 3) would eliminate all Sale No. 68 impacts to the Sanctuary. Delaying the Sale would postpone the potential impacts.

c. Conclusions (Alternative 1): Impacts from Sale No. 68 could alter the character of the Channnel Islands National Marine Sanctuary by impacting seabird, pinniped, intertidal and subtidal benthic resources. Recreational and cultural resources could also be effected. Although most impacts would probably be minor, it was the presence of these resources that served as a primary driving force for designation of the Sanctuary in the first place. Therefore, even minor changes would take on added significance.

d. Cumulative Impacts (Alternative 1): Moderate to high ecological losses are likely to impact several of the most important resources within the Channel Islands National Marine Sanctuary. Specifically, seabird and pinniped populations are likely to decline in numbers. The diving seabird (for example, pelicans) and fur seals are most vulnerable. However, all the seabird and pinniped species utilizing this area will probably be effected. To a lesser extent, intertidal and subtidal benthic resources are also likely to be deleteriously impacted. To reiterate, some of the key characteristics of the Northern Channel Islands, which were primary factors in having the area designated a marine sanctuary (and a National Park) will probably be significantly altered by cumulative impacts.

c. Conclusions (Alternative 1): Impacts from Sale No. 68 could alter the character of the Channel Islands National Marine Sanctuary by impacting seabird, pinniped, intertidal and subtidal benthic resources. Recreational and cultural resources could also be affected. Although most impacts would probably be minor, it was the presence of these resources that served as a primary driving force for designation of the Sanctuary in the first place. Therefore, even minor changes would take on added significance.

d. Cumulative Impacts (Alternative 1): Moderate to high ecological losses are likely to impact several of the most important resources within the Channel Islands National Marine Sanctuary. Specifically, seabird and pinniped populations are likely to decline in numbers. The diving seabirds (for example, pelicans) and fur seals are most vulnerable. However, all the seabird and pinniped species utilizing this area will probably be affected. To a lesser extent, intertidal and subtidal benthic resources are also likely to be detrimentally impacted. In retrospect, some of the key characteristics of the Northern Channel Islands, which were primary factors in having the area designated a marine sanctuary (and a National Park) will probably be significantly affected by cumulative impacts.

[illegible] time for oil spill cleanup and containment equipment to be mobilized. The meteorological conditions off Southern California are fairly good for handling an oil spill. With this additional time, the chances of effectively protecting sensitive marine resources are greatly increased.

Specifically, the seabird, pinniped and benthic resources would be less likely to be directly contacted by the oil. Even if the oil did reach these resources, there would be less of it, it would be more weathered, and it would be less toxic.

Increasing the distance between OCS development and these resources would also reduce the vessel traffic, human intrusion and noise generated during exploration and development. Potential disruption of critical breeding and resting activities for seabirds and pinnipeds would, therefore, be reduced. Also, the risk of damage from platforms and pipelines, to hard bottom critical areas, would be eliminated. Lastly, deleterious effects from drilling muds, cuttings and formation water would be greatly reduced.

Potential impacts to recreational boating, fishing and diving within the Sanctuary will be reduced by adopting Alternative 1. Cultural resources will not be subjected to the [illegible] of exploration and development activities (see Section IV.C.10).

It is important to note that these unusual and valuable resources (intertidal, subtidal benthos, pinnipeds, seabirds, recreational and cultural) were major reasons the area was designated as a National Marine Sanctuary and a National Park. Adopting Alternative 1 (deleting tracts within the Sanctuary) would help maintain the characteristics and qualities that were prime reasons for designating the Northern Channel Islands as a National Marine Sanctuary and a National Park.

Cancelling the sale (Alternative 2) would eliminate any Sale No. 68 impacts to the Sanctuary. Delaying the sale would postpone the potential impacts.

10. Terrestrial Resources

a. Alternative 1: If an oil spill should strike shore, terrestrial plants and animals may be killed outright by the spill or, inadvertently, as a result of cleanup efforts that will take place after a spill. However, the extent of these impacts should be minor.

The amount of habitat destruction caused by construction of onshore pipelines depends upon the extent existing pipelines and rights-of-ways are used. The Santa Barbara Area will have two pipelines, one already in existence, and the third, by Point Conception, assumed to be in existence by the time oil from Sale No. 68 is ready to be transported to shore. Obviously, no impact to terrestrial resources will result from pipeline construction if the construction has been already completed.

The Inner Banks area has several already existing pipelines crossing the shoreline in the Los Angeles-Long Beach Harbor area. A new pipeline resulting from Sale No. 68 is projected to come ashore at El Segundo (Transportation Scenario 1). Although this area is higly developed, industrially and domestically, the endangered blue El Segundo butterfly is located here. (For a discussion of Endangered species see Section IV.C.7.)

For coverage of the probabilities of a hit from an oil spill, based upon the oil spill model, refer to the Intertidal Section (IV.C.4).

b. Other Alternatives: No pipelines or refineries are planned for the islands of the Channel Islands National Marine Sanctuary, so no impacts will result from pipeline activity. For oil spill probabilities, refer to Section IV.C.4.b.i. Cancelling the Sale would eliminate any Sale related impacts while Delaying the Sale would simply postpone them. In the latter case, impact levels at a later date should be comparable to those experienced if the Sale were held as scheduled.

c. Conclusions (Alternative 1): The terrestrial biological resources are not expected to sustain even a low ecological loss from proposed Sale No. 68. This is because of the slight chance that an oil spill will impact some terrestrial species, and the relatively minor onshore activities that could create impacts.

d. Cumulative Impacts (Alternative 1): Oil activities have and will continue to have a nearly negligible impact, in comparison with impacts on the terrestrial biological resources from other activities within the area. Refer to Figure III.B.8-1 for an example of the remaining natural terrestrial environment in Southern California nearly 10 years ago.

The only exception to the prediction of low ecological loss from terrestrial biological resources is the possible land pipeline from Point Conception to Los Angeles. Impacts along the way of the pipeline would be high to the remaining natural habitat.

11. Coastal Economy

a. Alternative 1: Proposed OCS Sale No. 68 would stimulate investment and would generate jobs in the Southern California region. Table IV.C.11.a-1 shows estimates of yearly changes in the number of jobs due to Sale No. 68 and indirect and induced economic activity. This estimate does not include jobs in the transportation sector which are discussed in Section IV.A.3. The direct employment in offshore oil and gas activities is shown in Column A of this table. Column B shows the total estimated direct, indirect, and induced employment. Jobs which are expected to be filled by transient labor are not included in these estimates. Examples of transient labor are the drilling crews that live onboard vessels or reside near the local port of origin.

Employment increases should peak around 1990 and decline substantially by the year 2002. In all the county labor markets that were examined, employment increases were less than 1 percent over the projected base. The Harris Model predicts that the greatest relative impacts in the study area would occur in Santa Barbara and Ventura counties where the estimated peak employment increases are 0.58 and 0.27 percent over total projected employment, respectively.

The introduction of OCS-related investment to the region generates direct and multiplier effects in many sectors of the economy. The Harris Model assumes that most of the platform fabrication and other manufacturing and construction activities will take place in the Southern California region. It also assumes that the demand for business services would be in the county where oil and gas is landed. Because of these assumptions, the Harris Model results should be viewed as a high-impact case. (An alternative analysis of employment and population is presented at the end of this section.)

Harris model forecasts of the peak year increase in personal income, private investment, value added, state and local government purchases, and gross regional product are given in Table IV.C.11.a-2. The model predicts a sudden, short-term increase in economic activity in Santa Barbara County and relatively modest increases in the other counties studied. In Santa Barbara County, private investment is projected to rise by 12.0 percent during 1987, with a subsequent increase in gross regional product of 1.7 percent in 1992. In the other affected counties, the change in private investment is small, resulting in a less than a 1.0 percent rise in gross regional product. Estimated per capita income changes, which are included in the tables in POCS Technical Paper No. 81-3, are immaterial.

Since many analysts believe that platform fabrication may occur at a foreign location, the Harris Model results may be viewed by some as an overstatement of U.S. economic activity generated by Sale No. 68. Using simplifying assumptions, an alternative estimate of employment and population impacts was made. This estimate assumes that much of the platform fabrication and the business services demand would occur outside California. Using an employment multiplier suggested by county business patterns, indirect and induced employment was derived. Table IV.C.11.a-3 shows the results of this alternative analysis.

TABLE IV.C.11.a-1

CHANGES IN NUMBER OF JOBS DUE TO PROPOSED SALE NO. 68 ACTIVITY (CONDITIONAL MEAN RESOURCE ESTIMATES)

YEAR	1987		1992		1997		2002	
	A	B	A	B	A	B	A	B
COUNTY								
Santa Barbara	100	632	10	843	10	229	10	43
Ventura	95	807	10	803	10	172	10	-242
Los Angeles	161	472	98	2,085	32	1,218	32	789
Orange	39	212	53	622	28	313	28	174
San Diego	0	77	0	169	0	107	0	98
REGIONAL TOTAL	395	2200	171	4526	80	2039	80	862
CALIFORNIA	395	1876	171	4786	80	2826	80	1734

A denotes estimated direct employment

B denotes the total of direct and induced employment

Source: Curtis Harris Model, 1980.

TABLE IV.C.11.a-2

CHANGES IN VARIOUS ECONOMIC COMPONENTS FOR THE YEAR 1992 DUE TO SALE NO. 68 ACTIVITY (THOUSANDS OF 1967 DOLLARS)

	Personal Income	Private Investment[a]	Value Added	State and Local Government Purchases	Regional Product
Santa Barbara	16,336	97,955	57,383	2,534	58,878
Ventura	16,450	16,314	55,417	2,764	57,064
Los Angeles	46,224	150,904	136,576	8,504	142,000
Orange	12,648	37,994	30,628	2,322	31,964
San Diego	3,796	270	4,392	713	4,800
REGIONAL TOTAL	95,454	303,437	284,396	16,837	294,706
CALIFORNIA	95,488	303,436	284,352	16,840	---

[a] These values are for the year 1987.

Source: Curtis Harris Model, 1980

TABLE IV.C.11.a-3

SUPPLEMENTARY ANALYSIS - EMPLOYMENT AND POPULATION CHANGES ASSOCIATED WITH SALE NO. 68 ACTIVITY (BASED ON CONDITIONAL MEAN RESOURCE ESTIMATES)

Year	New Resident Direct Employment	New Resident Indirect and Induced Employment	Total New Resident Employment	Total Population Change from Base Projection
1982	55	91	146	336
1983	246	406	652	1,499
1984	347	573	920	2,116
1985	372	614	986	2,268
1986	406	670	1,076	2,475
1987	393	648	1,041	2,394
1988	346	571	917	2,109
1989	287	474	761	1,750
1990	282	465	747	1,718
1991	219	361	580	1,334
1992	173	285	458	1,053
1993	80	132	212	488
2006	80	132	212	488

Source: BLM Estimates, 1980.

(The population changes also reported on this table are discussed in Section IV.C.12.) The distribution of employment gains among the counties studied is as follows: Los Angeles, 51.0 percent; Santa Barbara 17.0 percent; Orange, 15.0 percent; Ventura, 12.0 percent; and San Diego, 5.0 percent. A comparison of the Harris Model with the supplemental analysis reveals that the Harris Model results range from two to ten times greater.

b. Other Alternatives: Alternative 2 is the deletion of 13 complete and 23 partial tracts located within the Channel Islands National Marine Sanctuary. If these tracts were not leased, the potential economic effects of Sale No. 68 could be lessened. However, based upon a qualitative estimate of resources and associated developmental activity provided by USGS, no measurable change in economic activity is expected to result from not leasing within the sanctuary area. The estimated socio-economic impact of Alternative 2, then, is the same as that described for Alternative 1.

If delay of the Sale, Alternative 3, were chosen, the impacts described in this section could occur at a future date; however, the relative significance of impacts may vary due to changes in future economic activity. For example, the amount of economically recoverable resources could be increased if newly arising technologies made recovery more efficient.

If Alternative 4 were selected, the Sale would be cancelled and the activity described for the proposed action would not occur. None of the local economic impacts discussed in this section would occur. The implications of the No-Sale alternative on the national energy situation are discussed in Section II.B.3.

c. Conclusions (Alternative 1): As a result of Sale No. 68, a significant, short-run expansion in regional economic activity is predicted by the Harris Model. Value-added gains would occur principally in the petroleum mining, construction, transportation, and finance sectors. Employment in Santa Barbara and Ventura counties would be stimulated in the construction, finance, retail sales, medicine and education, and government sectors. Additionally, manufacturing employment would be stimulated in the Los Angeles area. No measurable effect on personal income is expected to occur. The economic indicators show that, in an absolute sense, Los Angeles County will experience the largest economic gains; however, the effect of these impacts is small when they occur in a large and diverse economy such as that of Los Angeles County. A comparison of the effects relative to existing economic activity reveals that Santa Barbara County should feel the greatest impact. In that county, value added (averaged across all industries) and gross regional product could increase by about 2.0 percent during the peak of activity.

The results of the supplemental analysis would show that minor economic impacts are expected to occur in this area because Sale No. 68 related construction and manufacturing activity would occur in other regions of the U.S. and possibly in foreign locations. In this case, the effects would be distributed throughout the U.S. or international economy rather than being concentrated within the Southern California region.

The employment created in the petroleum sector and in the many servicing and/or related industries would provide jobs for unemployed and underemployed persons in the region which is a beneficial effect. The Sale-related investment would have positive economic effects on the region. Assuming that much of the investment occurs in Santa Barbara County, the effect will be to change the nature of economic activities in the area. Growth in historically dominant industries would not occur.

d. Cumulative Impacts (Alternative 1): As a result of cumulative State and Federal offshore oil and gas activities and the projects at Vandenberg Air Force Base, the non-urban portions of the study area (principally Santa Barbara and Ventura counties) are expected to experience pressures to urbanize. Urbanization could cause the mix of industries to change, resulting in manufacturing and construction replacing the historically more dominant agricultural industry. Communities have the ability to control and direct onshore growth to a certain extent through planning programs which may include zoning designations. One important mechanism for controlling impacts is the local coastal program (LCP), which is concerned with land resources, residential development, industrial development, and energy facilities siting. LCPs contain land use plans and zoning ordinances which form the basis for permitting decisions.

12. Demography

a. Alternative 1: Proposed OCS Sale No. 68 would generate both direct and indirect employment. The availability of employment may attract job seekers and their families to the Southern California area. The proposal is expected to create about 400 new jobs in 1986 (not including jobs in the transportation sector) which is the peak year of direct employment. Employment should decline after the exploration and development phase is complete. Operations employment associated with offshore facilities may total less than 100 jobs. There would also be an increase in secondary employment in business services required by the oil industry. The largest gains in employment are expected in the retail sales sector with significant gains also occurring in the construction, manufacturing, and medical and educational institutions sectors. Total employment at the peak year (including direct, indirect, and induced employment) is estimated at 4,500 jobs.

Attendant population increases may occur in urban areas as a result of increased economic activity. The total estimated population change related to new employment as reported by the Harris Model for the five-county study area is shown in Table IV.C.12.a-1. Table IV.C.12.a-2 shows the differences between these projections and the baseline projections. In every county, the projected population increase is less than 1.0 percent. Table IV.C.11.a-3 shows the population estimates based on the supplementary analysis of employment changes. It is assumed that about 51.0 percent of these population changes would occur in Los Angeles County where they would be absorbed into the large socio-economic base. The remaining population increase, numbering about 1,200 in the peak year, would cause relatively minor impacts in the other four counties studied. Depending upon the location of support activities, Southern California versus the rest of the nation, population increases could range from 2,475 to 9,500.

TABLE IV.C.12.a-1

POPULATION FORECASTS WITH PROPOSED SALE NO. 68
(CONDITIONAL MEAN RESOURCE ESTIMATES)

COUNTY	YEAR					
	1982	1987	1992	1997	2002	2007
Santa Barbara	320,364	339,813	353,447	352,927	361,758	380,718
Ventura	542,471	610,686	670,772	718,627	768,703	828,704
Los Angeles	7,353,991	7,932,590	8,566,074	9,234,050	9,963,962	10,793,306
Orange	1,963,020	2,126,294	2,280,463	2,419,349	2,565,495	2,739,514
San Diego	1,918,335	2,165,018	2,392,195	2,596,488	2,789,223	2,986,523
REGIONAL TOTAL	12,098,281	13,174,401	14,262,951	15,321,441	16,449,141	17,728,765
California	23,791,756	25,985,992	28,230,528	30,181,756	32,198,200	34,468,896

Source: Curtis Harris Model, 1980.

b. Other Alternatives: Alternative 2, which provides for deletion from the proposal tracts which are located within the Channel Islands National Marine Sanctuary, would result in generally the same population impacts as Alternative 1.

If the no-sale alternative were chosen, additional economic activity which generates population growth would not occur. The baseline projections of population would describe future population in the Southern California area.

If the delay-the-sale alternative were chosen, the impact on population would most likely be delayed for a period of time equal to the period of delay; however, if new technologies were developed, the oil and gas production profile may shift and the resulting pattern of economic activity and population growth may change.

c. Conclusions (Alternative 1): Population changes associated with proposed Sale No. 68 activity are expected to be small. The population increase, which is distributed over a five-county area, represents a 0.07 percent increase over the projected base at the peak year. Peak year (1992) estimated population increases by county are: Santa Barbara, 2,027; Ventura, 1,651; Los Angeles, 4,270; Orange, 1,086; and San Diego, 417. The most significant increases would be those occurring in the less urbanized counties of Santa Barbara and Ventura; however, it is not possible to determine which communities would experience the anticipated growth. The rate of change for the peak year in Santa Barbara and Ventura Counties is also minor (0.58 and 0.28 percent, respectively).

d. Cumulative Impacts (Alternative 1): The counties of Santa Barbara and Ventura anticipate significant population increases between 1980 and 1986 as a result of the Space Shuttle and Missile X programs at Vandenberg Air Force Base. A total civilian population increase of approximately 22,000 persons has been estimated (General Research Corporation, 1980) for these two projects. Taken by themselves, these two projects represent an average annual increase of 1.0 percent over the State of California population projections for Santa Barbara County for the six-year period, 1980-1985. (The Harris Model base projections already include population growth predicated upon employment associated with these two projects.) The population growth associated with proposed Sale No. 68 is anticipated to occur when these other projects are on the decline; nevertheless, welfare losses associated with infrastructure and social stresses may be generated by the combination of these activities. Population growth may cause stress due to shortfalls in public services and facilities and housing. These types of impacts are discussed in subsequent sections.

13. Public Facilities and Services

a. Alternative 1: Sale No. 68-related population changes may result in a demand for additional pubic and private services and facilities. The magnitude of impact given an increase in demand varies due to different service capacities and funding abilities among communities. The extent of

TABLE IV.C.12.a-2

POPULATION CHANGES ASSOCIATED WITH PROPOSED
SALE NO. 68 ACTIVITY
(CONDITIONAL MEAN RESOURCE ESTIMATES)

County	1987 Change	1992 Change	1997 Change
Santa Barbara	1,540	2,027	544
Ventura	1,682	1,651	353
Los Angeles	1,002	4,270	2,480
Orange	379	1,086	542
San Diego	240	417	261
REGIONAL TOTAL	4,843	9,451	4,180
California	4,544	10,060	5,828

Source: Curtis Harris Model, 1980.

fiscal impacts is related to the balance between industrial, commercial, and residential development in the tax base. Residential development is usually considered a drain on resources; however, new commercial and industrial development may cause a positive impact on tax revenues. The Harris Model cannot precisely predict the change in the tax structure given the uncertainties in the future economic and political environment. As an adjunct to the Harris Model forecasts, a study was done by Blaney-Dyett, Urban and Regional Planners, under contract to the Bureau. The study examined three categories of community services in Santa Barbara and Ventura counties. The impact on services in the remainder of the Sale area was not the subject of a detailed study, because the relative impacts outside the bi-county area are believed to be minor.

The Blaney-Dyett study reallocated the Harris Model generated population between the two counties based on past population trends, predicted share of future regional growth, accessibility to onshore oil and gas processing facilities, intercounty commuting patterns, and physical and institutional constraints to growth. Their analysis focuses on the peak year (1992) population of which 70 percent was allocated to Ventura County and 30 percent to Santa Barbara County.

For Santa Barbara County, the Blaney-Dyett study found that OCS population could increase deficits in water supplies by between 2 and 4 percent along the south coast. Impacts on wastewater facilities may not be significant, as only one plant would be affected. Also, adequate classroom capacity would probably exist throughout the county school system. The incremental costs of expanding community services to meet OCS-related needs could range from $243,000 for a mid-range resource find to $557,000 for a high resource find. It is estimated that 43 percent of these costs would be attributable to increasing water supplies, 9 percent to expanding treatment plant capacity, and the remaining 48 percent to educating school children (operating costs).

In Ventura County, OCS development could contribute to potential deficits in water supply and sewage treatment capacities. OCS-related development could increase a future shortfall in school capacity by 10 percent. The combined costs for additional services and facilities could range from $2.7 to $6.3 million with a mid-range and high find, respectively. Eighty-two percent of these costs is estimated for new school facilities and staff. Expanding water and wastewater systems could each represent about 8 percent of the total estimated costs.

b. Other Alternatives: The impact on public services and facilities for Alternative 2 is estimated to be comparable to those associated with Alternative 1 because of the similar population estimates. Cancellation of the Sale, Alternative 3, would eliminate the impacts just described. Impacts resulting from Alternative 4 would generally be the same as for the proposal, except that they would occur at a future date.

c. Conclusions (Alternative 1): Population growth resulting from Sale No. 68 could place some burdens on public services and facilities in Santa Barbara and Ventura counties. The economic impact of providing additional community facilities would fall upon local governments. Options available to accommodate OCS development range from growth management systems to conservation strategies to construction programs. However, the sources of funding for any programs cannot be identified with any certainty.

d. Cumulative Impacts (Alternative 1): The previous offshore leasing projects and the programs planned at Vandenberg Air Force Base amplify the problems associated with accommodating new residents. The combined effect of all new activities on population could be as many as 31,500 persons, with most of the development pressure occurring in Santa Barbara and Ventura counties. The baseline population projections against which OCS population increases were compared included estimates for other future, large-scale projects. The incremental impacts attributable to OCS development, then, represent the expected change and/or cost given concurrent expansion in other sectors of the economy.

14. Coastal Land Use

a. Alternative 1: Primary impacts on land use will result from demand for land for facilities necessary for the exploration, development, production and transportation phases of OCS oil and gas activity. In addition, there may be secondary land-use impacts caused by the physical demands for land for the additional population. This could result in an increase in the the demand for housing, schools, recreation sites, transportation services and city services (see Section IV.C.11, Demography).

While population increases due to OCS development are expected to be negligible, and thus no strain on water supplies, additional water requirements will be created at the OCS-related facilities themselves. Operations bases will require approximately one million gallons of fresh water (largely non-potable) for each exploratory or development well which is drilled.

The following discussion deals with the physical impacts on onshore facilities for OCS development.

This information is based on the NERBC/RALI Onshore Facilities Related to Offshore Oil and Gas Development Factbook (Nov., 1976).

It is important to realize that any development resulting from the proposal (industrial or other), which may occur within the coastal zone, will be subject to the land-use controls of the local jurisdictions. These land-use controls will be identified and implemented through the Local Coastal Programs (LCP) and Port Master Plans. Also, it should be noted that there is OCS development in the area at present, and most onshore facilities are already in existence.

Temporary Service Bases are staging areas from which equipment, supplies and personnel can be ferried by supply boats and helicopters to offshore rigs during the surveying and exploratory or development drilling stage. They require 5-10 acres of flat land on an all-weather harbor, 200 feet of wharf on the waterfront within 15-20 feet of water depth at the pier and 5,200,000 gallons/rig/year of fresh water during drilling.

Permanent Service Bases are set up as development and production phases get underway with a commercial find. Basically, these bases perform essentially the same functions as temporary bases. The principle differences are size, and intensity of activity. They require 50-75 acres of flat land on an all-weather harbor, 400 feet of wharf on the waterfront with 15-20 feet of water depth and 8,200,000 gallons/platform/year of fresh water during drilling.

Repair and Maintenance Yards will probably be required to provide services for offshore vessels and equipment. They will require locations accessible to road, rail and air transportation. It is unlikely that such yards catering specifically to the needs of the petroleum industry would be newly sited in a frontier area. However, these services could be rendered by existing marine repair facilities and could experience expansion in direct relation to the amount of offshore activity.

Bases Supporting Platform and Pipeline Installation may be located separate from or contiguous to other service bases. Those bases will require flat land for waterfront warehouse space, pipe-coating yards, service/maintenance facilities for the vessels and barges, and possibly land for a helipad. The amount of land required depends on the extent of the commercial find, but at least 5-10 acres and a minimum of 200 feet of marginal wharf is needed.

Pipelines and Landfalls for bringing the oil onshore. Landfalls require a 50-100 foot right-of-way, and, if needed, 40 acres for a pumping station or 60 acres for a tanker and barge terminal. Land use impacts are dependent upon whether the pipe must cross marshes, barrier beaches, open fields or urban areas. This could disrupt other land uses (such as recreation) and life cycles within marshes.

Depending on the location and size of the offshore find, how the oil and gas will be transported and the ultimate destination of the fuels, the following facilities may be constructed onshore:

Partial Processing Facilities would require 15 acres of flat land per 100,000 barrels of petroleum mixture processed. Ten thousand gallons of water per month would be required.

Gas Processing and Treatment Plants would require 50-75 acres of flat land and 200,000 gallons of water per day.

Marine Terminals would require 30-100 waterfront acres (mainly for storage tanks) and a waterfront with 50-60 foot depth of sheltered water at the pier or mooring bouy.

Refineries would require 1,000-1,500 acres of clear flat land zoned for industry, and 10.5 million gallons of water per day.

The California Coastal Zone Management program encourages industrial facilities to locate or expand within existing sites unless they cannot feasibly be accommodated. Even then, there are provisions which would allow for development if: 1) alternative locations are infeasible or more environmentally damaging; 2) to do otherwise would adversely affect the public welfare; 3) adverse environmental effects are mitigated to the maximum extent feasible. Coastal development permits will be subject to approval by the Coastal Commission until local Coastal Plans and/or Port Master Plans are completed and approved. Therefore, since the facilities will probably be sited in port areas with existing industrial-zoned areas, any significant change in land use is not anticipated.

Housing units required in the Southern California counties as a result of Sale No. 68 direct and indirect activity is expected to be 3,514 during the peak year of 1992 (based on 2.69 people/housing unit). This would represent an increase of 0.085 percent over the 4,152,449 housing units available in 1975. This would not be a significant increase for the region, and the number for each county are as follows: Los Angeles County, 1,587; Orange County, 404; Santa Barbara County, 754; Ventura County, 614; and San Diego County, 155. In addition to housing, there will also be need for hospitals, schools and other public service facilities. The facilities will be sufficient with or without the Sale to handle the demand of the additional load on a regional basis. However, there might be specific areas where new facilities will be required.

Presently, there is no way to project the number of industrial and commercial activities that may be required to meet the increased employment and population needs, other than identifying those sectors in the Harris Model which show increases projected. However, this would only indicate that a particular sector is expanding, not how many facilities that sector would require.

b. Other Alternatives: The deletion of the tracts in the Channel Island Marine Sanctuary would not change the impact on onshore land use as stated above. There is not expected to be any change in the number of facilities, due to the reserve estimates for the area being relatively low. Delaying the Sale would postpone potential impacts. It is possible that during such a delay there would be an improvement on safety and cleanup equipment. Cancelling the Sale would, of course, eliminate all sale-related impacts.

c. Conclusion (Alternative 1): Due to the level of OCS activity and other industrialization in the Sale area, it is reasonable to assume that little adverse impact can be anticipated to the land use in the area from Sale No. 68. Any impact that does occur should be regulated since there are a variety of land-use controls available to facility siting and population-associated land requirements.

d. Cumulative Impacts (Alternative 1): Cumulative impacts on land use will consist of potential impacts from Sale No. 68 added to the impacts associated with previous offshore oil and gas development, and all other projects which affect land use, such as the proposed LNG facility, Space Shuttle and Missile X System, and onshore oil and gas. Previous OCS activity including onshore secondary land use are anticipated to require about 68,000 acres for the five county area. Thus, figure includes about 17,000 areas strictly from Sale No. 48. The Space Shuttle and the Missile X projects both primarily affect Vandenburg A.F.B., but will require approximately 1,500 housing units in the local areas for the construction workers. The direct and indirect work force will, however, require about 8,000 housing units which will have a severe impact on the local areas in North Santa Barbara County where most are expected to reside. This Sale No. 68 impact on land use, although relatively minor by itself, will tend to put a strain on future development in the area when combined with the other proposed activities for the Southern California area.

15. Impacts on Recreation

a. Alternative 1: Recreation is a very personal activity in that what might be a thoroughly enjoyable recreational activity to one person might be unacceptable to another. Thus, the effects of the impacts on recreation tend also to depend on the activity being furnished, the area impacted and the size or quantity of the impacting agent. Therefore, this analysis shall deal, in general, only with impacts on the major recreational areas and the associated local economies.

An impact on recreation will be noticed where oil spills contact the shoreline in the form of oil-tainted beaches. Oil fouling could result from chronic spillage or major accidents, such as the 1969 Santa Barbara Spill or the Amoco Cadiz Spill. An impact could also be noticed offshore in areas of recreational boating, and in the underwater parks (see Figure III.C.5-4). If large quantities of oil entered the coves, damage to marine life could occur, and all water contact and general beach-use activities would tend to be stopped until the cleanup was completed. The general impact of oil spills on harbors, ports and marinas will be a reduction in the amount of boating which takes place at that particular harbor, and could mean the closure of the harbor by a boom to prevent oil from entering and contaminating the hulls of the boats.

Beach fouling and surface slicks could result from chronic spillage. This would be relatively minor compared to the major accidents, but would be a continual nuisance to the recreationalists. Tar balls and oil tainting would be the main impact. The magnitude of these impacts would be comparable to those from the natural seeps. The overall impact on the beaches would be very minor, and would tend to reduce beach use at a particular site on a day-to-day basis, as is seen at present when the tar from the natural seeps impact the beaches in the Southern California area.

Manmade structures are listed and discussed in Section IV.A.2. The impact on recreation will be according to the structure involved. Offshore structures impact recreational boating, and any additional structures from this proposal will increase the present impact in the Santa Barbara Channel and the San Pedro-Long Beach area. These additional impacts are expected to be minor. Pipelines will impact beach use and surf zone areas where they contact the shore. The duration of pipeline installation through the beach zone will be 1 to 10 weeks during which time a section of the beach will be closed. When work is completed, the first high tide will remove all traces of work on the intertidal zone and the first storm will erase marked areas from the upper beach if the pipeline is buried (see pipeline stipulation Section I.B.6.g.). In this case, the beach would have then returned to its original state. However, if there is a necessity to cover the pipeline with riprap through the surf zone, there will be a negative impact on surfing and sightseeing, yet a positive impact for sport diving and fishing. These benefits will result from an aggregation of fish and crustaceans due to the of the riprap. (A pipeline at Padre Island National Seashore, Texas, closed 1,200 to 1,500 linear feet of shoreline to public use for 2 to 3 weeks, but the burial of the pipeline offshore tended to attract sport fishermen.) Onshore facilities will impact any recreational facilities in the immediate vicinity. However, this impact can be minimized by utilizing existing facilities and placing any new facilities in areas of similar development.

Due to the large number of vessels which presently operate in the area the increased vessel traffic will have a minor impact on recreational boating.

Noise will be noticeable during all stages, but mainly during development and abandonment when construction and teardown are taking place. Lower levels of noise will be found during the entire life of the sale area from such sources as helicopters flying to and from the offshore platforms, and the increased number of boats operating in the area. These noises will not be readily apparent as they will be absorbed by the existing noises in the area, and will appear as a slight increase in the total noise spectrum.

The aesthetic disturbances will be the noises previously mentioned, and the slight change of the skyline by the introduction of structures. The aesthetic impact will also be seen where pipelines come ashore, as any riprap covering, if used, will be visually unappealing, and will form an artificial barrier across the beach. Additionally, there will be an earth scar, which will last for a considerable length of time, onshore along the pipeline right-of-way. (For an additional discussion of visual resources, see Sections III.C.10, and IV.C.21, and Technical Paper No. 81-5.)

Changes in economic activity are found in the Harris Model as projections over the expected project life in the sale area. The impact on recreation for the California coastal counties is a general increase in demand, caused by the expected expenditure on recreation.

Tourism is the second largest industry in the sale area. Because much of the tourism is dependent upon water-oriented recreation, an oil spill could have a considerable impact on the industry. In the event of an oil spill impacting the coast, the effect on the tourist industry will depend on the extent of the spill and partly on the news media. If the publicity was "non-dramatic," the cost to the tourist economy would be localized and lessened. However, if the event is dramatically publicized and becomes a highly emotional issue on the national level, it will tend to have a major impact on tourism. This was seen in August of 1979 when the economic impact of the Ixtoc I oil spill hit the Texas beach communities approximately two weeks before the major pollution impact. Also, this was noted by the French government in the summer of 1978 after the Amoco Cadiz spill, where tourists stayed away from the Brittany Coast, including those areas which had not been impacted as well as those which had been cleaned. Representative figures of the impact on the tourist industry of the South Texas Coast are seen in Table IV.C.15.a-1, which gives the change in attendance at Padre Island National Seashore. By using this table in conjunction with Tables III.C.5-1 and III.C.5-2, it is possible to determine a feasible maximum economic cost to any of the coastal counties under the "worst case" oil spill as none of the basins are expected to have

TABLE IV.C.15.a-1

CHANGE IN TOURISM AT PADRE ISLAND NATIONAL SEASHORE, TEXAS, DURING IMPACT OF IXTOC I OIL SPILL

	1978	% Change 78-79	1979	% Change 79-80	1980
January	23,379	+20.9	28,267	+13.6	32,118
February	30,209	+18.0	35,657	-9.7	32,209
March	91,285	-18.1	74,754	-3.2	73,098
April	65,403	+25.7	82,199	+13.7	93,447
May	109,340	-9.7	98,775	+2.0	100,752
June	119,296	-8.9	108,661	-36.3	69,225 (c)
July	131,244	-13.7	113,203 (a)	+12.3	127,089
August	119,068	-25.4	88,843 (b)	-20.3	70,794
September	51,457	-23.8	39,210	+81.6	71,201
October	52,581	-9.8	47,447	+6.4	50,480
November	43,917	-15.6	37,086	-21.2	29,222
December	29,795	-1.4	29,368	-9.5	26,574
Total	866,974	-9.4	783,470	-0.9	776,209

Source: National Park Service, Padre Island National Seashore

(a) Gasoline Shortage July, 1979
(b) Oil Reaches Texas Beaches August, 1979
(c) Hurricane Hit Area June, 1980

reserves under pressure which could produce at the force and volume of the Ixtoc blowout. (The Ixtoc I spill lasted 296 days and spilled an estimated 3.1 million barrels of oil.)

The Santa Barbara oil spill in 1969 was and still is the worst blowout in U.S. waters, and lasted for 10 days, with approximately 5,600 barrels spilled (1973 annual meeting, AAPG). Since that time technology has improved; far stricter safety requirements are in effect. Thus, any spill that might occur in the Sale No. 68 area is estimated to last no more than four or five days or leak more than 1,000 barrels/day. The Amoco Cadiz was 1½ km from shore when it ran aground and it is estimated to have lost 90% of its 1.6 million barrels cargo within the first 11 days of the spill. This amounted to an average of 131,975 barrels per day for the first 11 days and then an average of 18,000 barrels for the remaining nine days. Of this oil, it is estimated that 586,400 barrels actually impacted the shoreline, with approximately 470,000 barrels coming ashore within the first 2½ weeks of the spill, and impacted 72 km of shoreline. This was the result of a super tanker grounding virtually on the beach, and in an area of extremely strong currents and high tidal ranges, which are not found in the Sale No. 68 area. However, by studying these incidents, it is possible to get a worst-case impact for the area.

Southern California has numerous recreational and tourist areas which are sensitive to potential impact from oil spills. These areas are listed in Technical Paper 68-5, and the probability of any of these areas being impacted can be determined from the oil spill model (Section IV.A.1.a.), once the shoreline segment for the particular area has been determined. The impact to the local economies can be approximated by estimating the number of tourists who would stay away from the area. This percentage would be greater for the small communities than for large cities. In Los Angeles, a majority of tourists spend their time sightseeing and attending cultural affairs, as opposed to the small communities and the rest of the coast where tourists tend to spend their time relaxing at the beach, fishing or enjoying the local coastal environment. Thus, the small community whose economic base is heavily dependent on tourism could be more severely impacted than the larger towns/cities. The closing of the beaches would increase the reluctance of tourists to go to the area, and they would tend to stay away from the impacted area even after it was cleaned, due to the publicity that is associated with spills.

The large city, however, would probably only have a slight reduction in tourism, as there are numerous other activities which people would substitute. Businesses along the beach would be most seriously impacted economically, but would tend to be more able to survive than their small community counterparts, due to the number of people in the city who would go down to the beach to see the oil.

In the event that a spill does occur, containment will be initiated at the point of the spill, thus reducing the amount of free oil comprising the spill. The spill will partially weather before contacting the shore, and when this is combined with the preparations in the local Oil Spill Contingency Plans, the impact on the shoreline will be lessened considerably. There could still, however, be a closure of the beach for a period of time. In the presence of only tar balls, the beach could still be used during cleanup operations, as has been seen along sections of Cape Hatteras National Seashore.

The time involved for cleanup operations depends entirely on the size of spill, the extent of shoreline impacted, the effectiveness of the absorbers and cleanup equipment, the type of shoreline impacted, the accessibility of the impacted area, the speed of the response team and the weather.

Tourism, however, will remain normal for the total Sale area with localized reductions. The exact economic impact cannot be stated as it is entirely dependent on conditions present at the time of the spill and not on conditions at present, and has to include all costs of cleanup, loss to the local economy and compensation to the local businesses.

The aesthetic impact will be serious in the case of a spill contacting the shoreline for the period of contamination. However, the impact of offshore structures will be relatively minor as the distance offshore that the structures are situated will affect the size of the object seen (see Figure IV.C.20-1).

b. Other Alternatives: The impact on recreation due to the deletion of the tracts in the Channel Island National Marine Sanctuary will not change the impact stated above, except as follows. There will be a slight reduction in the possibility of any probable spill contacting the islands, and an extension in time of the potential contact. There is, however, little beach use on the Islands, and any recreation occurring is restricted primarily to the offshore area. There will be a lessening of the impact on recreational boating in the area due to the exclusion of the oil industry within 6 miles of the islands. Tourism will be unaffected by the deletion. Delaying the Sale would postpone potential impacts. It is possible that during such a delay safety and cleanup equipment would be improved. Cancelling the Sale would, of course, eliminate all Sale related impacts.

c. Conclusions (Alternative 1): The impact of the proposal on the recreation of the area will be minor unless an oil spill contacts the shoreline. Decline in recreational use would lead to a loss of tourist revenue, in areas where oil contacts the beach. The impact could be localized and short term with only mild economic consequences, but could become regional in scope and more economically damaging depending on the beaching location, size, duration, nature and season of the spill, and publicity associated with a major pollution incident.

d. Cumulative Impacts (Alternative 1): The cumulative impacts from existing industrial, residential development, and proposed Sale No. 68 and previous offshore oil and gas leases in California, are expected to be far greater than the previously listed impacts. The major impact would come from spilled oil, which could affect general beach use and recreational boating in any area of impact. Tourism would be affected by an amount dependent on the volume of oil, the time of year, the area impacted, and the extent of the news coverage. The maximum probability of a spill contacting the shoreline from Sale No. 68 alone is 10 percent for the east side of Santa Catalina Island, with the largest probability of 5 percent for an impact on the mainland. Note, however, that with all the other potential sources of oil spills this probability rises to 93 percent. Thus, Sale No. 68 slightly increases the already strong probability that a serious spill could occur.

16. Oil and Gas Infrastructure: It is assumed that the refineries in Los Angeles (LA) basin have the capability and would process all of the produced Sale No. 68 crude oil (I.B.1.c). Also, it is assumed that the crude oil would back out an equal amount of either foreign, or Alaskan crude oil. Unless the Sale No. 68 crude oil is beyond the refineries, limiting factors, for example, sulfur content, there should be no impact on the refineries. With relatively sour (high sulfur) and heavy (low API) proposed crude, the refineries may be required to make expensive modifications to refining processes.

17. Transportation Systems

a. Ports and Shipping

i. Alternative 1

Impacts on ports from the proposal could be from increased employment and possible oil spills impacting the ports. Increased employment at the ports could be considered as part of the secondary employments which will be described below. If an oil spill impacted a port, deployment of containment booms or other oil spill equipment could delay the entry or departure of vessels from the port. Analysis of the oil spill model (POCS Technical Paper No. 81-2), using Transportation Scenarios Nos. 1 and 2, indicate that the probabilities of one or more oil spills greater than either 1,000 or 10,000 barrels contacting a port within 30 days is less than 6 percent. Ports investigated for oil spill impact are: Port Heuneme, Los Angeles-Long Beach, and San Diego. The probability of an oil spill hit at Santa Barbara harbor is even less than 6 percent.

Impact on shipping from the proposal could be from increased shipping and increased employment of crew members. The impact is based on the production year of 1990 for Scenario No. 1 (POCS Technical Paper No. 81-1). Increased shipping could result in increased commerce and vessel accidents. Increased employment could result in increased wages which would be beneficial to local business.

Sale No. 68 barging traffic is about 2.6 percent of the estimated tanker traffic to the Ports of Los Angeles and Long Beach (LA-LB) at 1990. The Sale No. 68 barging traffic, which is described below, is the total barge trips at 1990 to Ports of LA-LB. The estimated commercial tanker traffic, which is described below, is the estimated total traffic projected from the referenced estimates indicated below. In 1990, Sale No. 68 crude oil would be transported as follows: 1) A 20,000 bbls barge would make approximately 38 trips per year from the area south of Santa Rosa Island to LA-LB ports; 2) A 30,000 bbls barge would make approximately 107 trips via Dall banks and San Nicolas to LA-LB ports; 3) A 30,000 bbls barge would make approximately 119 trips per year from S.E. Tanner Bank/Santo Tomas Knoll area to LA-LB ports. At an estimated 1.77 percent increase of commercial vessels per year, the 1990 commercial tanker traffic entering the ports of LA-LB could be 10,140. The 1.77 percent was estimated from Reese-Chambers' (1980) average 10-year traffic increase through the Santa Barbara Channel sea lanes from 1980 to 1990. The value of 10,140 tankers was obtained by taking 27.5 percent of the total LA-LB-bound vessel traffic through the Santa Barbara Channel during 1978 (Reese and Chambers, 1980).

Increased shipping would result in increased direct employment which would increase the secondary employment by an estimated ratio of 3 to 4½ times the direct employment (FEIS Sale No. 53 IV.B.8). The direct employment includes crew members estimated for the proposed barges, crew, and supply boats. Barge transportation routes were described above. Crew and supply boats transportation routes are indicated in Section IV.A.2.a.

The above transportation would generate 85 direct labor jobs at the 1990 operation level which could add approximately 1.9 million dollars (1979 dollars) to the local economy in wages. The direct labor wage is based on $1,870 per month. The 85 direct jobs would generate approximately 319 secondary labor jobs at the 1990 operation level. This secondary labor would add approximately 7.5 million dollars. Impacts on navigation during exploration, development, and production could be from vessel traffic using traffic lanes crossing the proposed tracts and from vessel accidents (FEIS Sale No. 48, III.A.3). Restriction of exploration and development in traffic lanes could increase the cost of exploration and development of the proposed tracts. Vessel accidents are based on Transportation Scenario No. 1 (POCS Technical Paper No. 68-1) at the peak production year of 1990. These accidents could result in loss of human lives, personal injuries, property damages, and oil spills.

The Proposed Access Route (PAR) from Point Conception to the California-Mexican Border is described in Section III.C.7.a and illustrated in Minivisual No. 1. The PAR could partially or completely cross approximately 62 proposed tracts.

In comparison of cost between tracts with and without traffic lanes, the cost of exploration and development of tracts with traffic lanes could be substantially higher (FEIS Sale No. 53, IV.B.8). The higher cost could be mostly during development where two fixed platforms, one on each side of the traffic lane, might be needed instead of one. Development of shallow petroleum structures may prohibit the use of fixed platforms and a subsea completion system may be needed to develop those structures.

Estimates on accidents of any sort, that are caused by vessel traffic, are based on an equation of 8.2 x 10-5 vessel accidents per ship movement (McMullen, 1977). The second assumption is that the ship movement for the proposed sale is the number of round trips made by the proposed barges. Vessel accidents could be caused by vessels crossing the traffic lanes, vessels not adhering to the traffic lanes, vessels ramming into offshore structures, and vessels running aground (FEIS Sale No. 53, IV.B.8). Offshore platforms could provide a benefit for navigation with lighting, distinct marking and color, fog horn, radar, and other navigational aids (FEIS Sale No. 53, IV.B.8).

McMullen (1977) had indicated that the introduction of the vessel traffic lanes (Traffic Separation Scheme) in the Santa Barbara Channel in 1969 had represented a major change in the Channel vessel traffic procedures. During the 8-year period of established traffic lanes, there were no collisions or casualties in the Santa Barbara Channel.

The Eleventh District Coast Guard (personal communication, Lt. J. Terveen, January 1981) has proposed a PAR between Point Conception and the California-Mexico Border as described in Section III.C.7.a. Without any established sea lanes, the above-described vessel accidents could be much higher. In addition, the Eleventh District Coast Guard (personal communication, Lt. J. Terveen, January 1981) is recommending the following mitigating measures for platforms/structures located within 2 nautical miles of designated traffic lanes: Paint platforms/structures white and/or yellow to enhance their visibility in haze and fog; require this coating to be maintained during the existence of the platform; require reliable automatic emergency sources of power for platform's aids to navigation and vital control systems with a capacity for at least 48 hours of operation (NOTE: Some platforms are unmanned or manned part-time, and receive electrical power by cable which may or may not be buried); and consider radar reflection enhancement measures on small platforms.

ii. Other Alternatives: Alternative 2 (II.B.2) would decrease oil and gas shipping activities slightly below the proposal. This decrease in transportation would result in reduction of approximately 10 direct labor jobs at the 1990 operation level which could reduce approximately 0.23 million dollars (1979 dollars) from the local economy in wages. The direct labor wage is based on 1,870 dollars per month. Reduction in direct labor jobs of 10 would reduce approximately 38 secondary labor jobs at the 1990 operation level. This reduction in secondary labor would reduce approximately 0.86 million dollars from the local economy.

Increase in transportation could also decrease vessel accidents from 0.022 to about 0.020 (Alternative 2). The time required for oil spills to impact the ports by Alternative 2, as compared to Alternative 1, would be increased (IV.A.1.a).

Cancelling (Alternative 3) or Delaying the Sale (Alternative 4) would eliminate or postpone sale-related impacts. This, of course, assumes that selection of those alternatives would not result in increased oil imports via tankers.

b. Pipeline Systems

i. Alternative 1: Impacts from the pipeline system could be from pipeline breaks and leaks resulting in oil spill (IV.A.1) and pipeline damage. Pipeline breaks could be caused by ship anchors, fishing trawl gear, storms, etc. Pipeline leaks could be from corrosion, mechanical joint failure, etc.

One hundred fifty four kilometers (96 miles) of offshore pipeline (see Section IV.A.3.b) are proposed and about 2.6 pipeline failures are estimated for the duration of the proposal. Pipeline oil spill rates are estimated at about

3.7 percent (FEIS 53, P. 4-11) of the combined platforms, tankers, and pipeline oil spill rates. Based on data from the Gulf of Mexico (1964-1976) above 2.6 pipeline failures are predicted.

For offshore California, there is only one crude oil pipeline failure reported (FEIS 48, P. 692). In 1969, the pipeline to platform A failed and spilled 900 barrels of oil.

ii. Other Alternatives: Alternative 2 (II.B.2) would slightly decrease the pipeline activities and would probably increase the number of pipeline failures from 2.8 to 2.6 for the duration of proposal.

c. Additional Transportation Systems

i. Alternative 1: Impacts on other transportation systems from the proposal would probably be minor on the highways, railroads, airports, and power plants. Minor impacts on highways and railroads would be from increased traffic movements of oil- and gas-related equipment, supplies, and manpower to support exploration, development, and production. Traffic should increase during development and decrease during production. Increased traffic could occur at the Proposed Gaviota Supply Base, Carpinteria, Port Heuneme, Port of Los Angeles, and Port of Long Beach.

Minor impacts in airport facilities could be from operation of helicopters to transport men and light equipment from the airports to the oil and gas operation sites. Helicopters could operate from the following airports: Santa Barbara Municipal, Oxnard, Los Angeles International, Long Beach Municipal, John Wayne (Orange County), and San Diego International.

If spilled oil reached the cooling water intake, or outfall, of a power plant, there would probably be a short duration impact to power plant operation. The cooling water intake is located below the water surface. If oil entered the intake, fouling of the condenser would cause a 2 or 3-day power plant shutdown (Blowey, 1981).

Analyses of the information contained in the oil spill model (Section IV.A.1) indicates that the probabilities of one or more oil spills greater than 1,000 or 10,000 barrels contacting the power plants within 30 days is less than 6 percent. This analysis is based on Transportation Scenarios Nos. 1 and 2 in the oil spill model. Power plants with submerged ocean cooling water systems and within the proposed area are: 1) Los Angeles Department of Water and Power, power plants at Wilmington, Seal Beach, and Playa del Rey; 2) Southern California Edison (SCE) power plants at El Segundo, Long Beach, Oxnard, Redondo Beach, San Diego Gas and Electric (SDGE) power plant at San Diego Bay; and 3) Joint SCE-SDGE nuclear power plant at San Onofre.

ii. Other Alternatives: Alternative 2 (II.B.2) would slightly decrease the impacts over the described for highways, railroads, airports, and power plants. Cancelling (Alternative 3) or delaying the Sale

(Alternative 4) would eliminate or postpone Sale-related impacts. This, of course, assumes that either of those actions would not regult in increased oil imports and tankers.

d. Conclusions (Alternative 1): The proposal could generate some increased direct employment to shipping, and some increased secondary employment to the ports. Whiel the increase in employment is realtively small when compared to total employment in the regional economy, for certain sectors, locales, and businesses, it could be significant. The impact of a major oil spill could require a temporary rerouting of the ship traffic and could delay the entry or departure of ships from the ports. Demand for port facilities from the oil and gas industry and other users would probably result in increased use of limited space and port resources. Increased user charges and/or expansion of port facilities would likely result. The extent of these changes would largely be determined by local planning agencies.

Traffic lanes crossing the proposed tracts could increase the cost of exploration and development substantially (Alternative 1). The estimated vessel accidents during the proposed sale for exploration, development, and production should be small (Alternative 1).

Offshore pipeline breaks and leaks that could be caused by ship anchors, fishing trawls, storms, corrosions, etc., would be small in the number of failures (Alternative 1). Consequently, oil spills from pipeline failures would be small when compared to combined oil spills from platforms, tankers, and pipelines (IV.A.1).

The proposal (Alternative 1) could cause minor impacts to traffic movements on highways, railroads, and airports. Oil spills could cause short-term impact on the operation of power plants that depend on ocean-cooling water.

Alternative 2 could have minor impact reduction in the above-described conclusion for the proposal. Deletion of leasing and drilling within the Sanctuary would probably decrease oil and gas activities slightly, resulting in corresponding decreases in labor and dollars to local economy, shipping accidents, oil spills impacting ports and power plants, and decreases in traffic to highways, railroads, and airports.

e. Cumulative Impacts (Alternative 1): For the cumulative impacts on transportation, the following projects were considered for economics and navigation: Existing Federal and State oil and gas leases in the Bight, existing shipping, and Sale No. 68. To compare transportation between the cumulative projects and the proposal, an analysis was made based on the year 1990. It is estimated that the increase in cumulative shipping to Los Angeles-Long Beach Ports could be approximately 9 percent as compared to 2.6 percent (IV.C.17.a.1) for the proposal. The 9 percent increase could cause an increase in the expected number of vessel accidents from 0.0200 to 0.0218. Increased cumulative shipping contributed by the existing Federal and State lease is about 2.4 times that of Sale No. 68.

Impact of an oil spill from cumulative projects (POCS Technical Paper No. 81-2) would be the same as the proposal, except the probabilities of one or more spills contacting ports and power plant increases very dramatically. The probability of an oil spill contacting Port Heuneme or the Ports of Los Angeles-Long Beach within 30 days (for a 10,000 bbl spill) is less than 6 percent for Sale No. 68. However, the cumulative probabilities are nearly 43 percent for Port Heuneme and 96 percent for Los Angeles-Long Beach.

18. Military Uses: The Department of Defense (DOD) conducts operations within the Southern California Bight and potential conflicts with OCS activities exist as discussed in Section III.C.8.

a. Alternative 1: If the Sale proceeds as proposed, military operation areas could be impacted. Meetings with DOD representatives resulted in the elimination of a number of tracts that were originally being considered for leasing. Of the remaining tracts, DOD indicates that tracts 164, 167, and 169 would interfere with operation of the Long Beach Naval Shipyard Electronic System Evaluation Facility (SESEF); tracts 56, 59, 105-107, 111-114, 118-121, 125-127, 133-135, 142-144, and 195-197 would interfere with operation of the Pacific Missile Range; and tracts 189-194, 203, 204, 206, 207, 209, and 210-221 would interfere with operation of the San Clemente Island Test Range. Detailed impacts and the effects of potential mitigation measures will be determined in joint DOD/BLM meetings prior to final tract selection.

b. Other Alternatives: Alternative 2 would remove one tract (111) from DOD concern. Cancelling the Sale will eliminate any impacts to DOD operations. Delaying the Sale will delay the impacts discussed in Alternative 1 as there are no plans to eliminate any of the DOD operating areas.

c. Conclusions (Alternative 1): Negotiations that will result in conditions allowing joint usage, potential mitigation measures, or tract deletion from the Sale are continuing between BLM and DOD and the results are not yet known.

d. Cumulative Impacts (Alternative 1): DOD uses most of the Southern California Bight for one purpose or another with schedules and types of usage depending on a number of factors. While oil and gas resources are predicted in several of the areas used by DOD, the extent of the resources are not known. It is not possible to predict cumulative impacts until oil and gas resource potentials have been identified and evaluated.

19. Cultural Resources

a. Alternative 1

i. Types of Impacts: Cultural resources are nonrenewable, and are at some risk from the leasing proposal.

Marine Archaeological Resources. The potential for damage or destruction of marine archaeological resources will begin during exploratory drilling. Drilling and anchoring impact an area up to 12 times the water depth, and, thus, are able to damage or destroy shipwrecks and/or aboriginal sites over a broad area. The risk to aboriginal sites is limited to waters $\leq$ 150 m deep. Because shipwrecks occur at all depths, there is the possibility of impacting a historic wreck on any tract. Those tracts with the greatest potential for risk to this type of resource have been identified in Section 19.a.ii, and appropriate mitigation has been recommended. Nevertheless, there remains a possibility mitigative efforts will not protect all of the resources at risk.

A source of potential impact is the use of divers, who may be employed by industry to explore for hazards, maintain equipment, or recover lost equipment. Divers may discover and collect previously undetected artifacts for themselves or others, or they may disclose the location of submerged artifacts to others who might salvage or plunder the site. Losses of this type have been reported previously in the Sale area, and some limited impacts to cultural resources should be expected as a result of this proposal.

Another, indirect, form of impact will affect any marine archaeological resources located in any area subject to exploration and/or development. This indirect impact results from the typically large amount of debris that remains on the seafloor many years after production ends. Debris may include those tools and supplies lost overboard; it may also include illegally jettisoned waste or surplus supplies (e.g., pipe, cable). This debris results in magnetic anomalies and side scan sonar images that will interfere with remote sensing analysis in future cultural resource surveys. This has been a continuous problem in areas previously leased. Another hazard to surveys may be caused by the operation of motors, winches, pumps, and various other equipment on drillships and platforms. A spectrum of sound and electromagnetic frequencies and magnetic fields results. This ceates "noise" on the records of remote sensing surveys undertaken in nearby areas. This is a relatively common problem in well-developed areas like the northern Bight. Types of interference with surveys will likely result in some resources not being appropriately identified, and could result in loss of or damage to some of the resources. Some limited loss of marine archaeological resources is expected from these types of interference.

There is a relatively low risk to marine archaeological resources from oil spill. Spill impacts on marine resources would most likely be in the form of contamination that would alter the appearance of artifacts or interfere with radiocarbon dating. However, significant resource impacts are not expected.

Terrestrial Archaeological Resources. Terrestrial development related to offshore oil and gas is a potential source of impact to terrestrial archaeological sites. Many of the historic and prehistoric sites along the coast in the Sale area are known and have been recorded. It is likely archaeological surveys will be conducted in any area of onshore development. However, it is possible some sites will be missed by a surficial survey; these undiscovered sites would be at risk. This risk is considered to be low.

When an archaeological site must be excavated because no other mitagory option exists, values to future investigators may be permanently lost. Unavoidable damage to historical or prehistorical values will occur when sites are not identified in time for preservation.

Oil spills are not expected to produce direct impacts to terrestrial archaeological resources. However, indirect impacts to these sites are possible if heavy equipment is brought into beach areas for cleanup activities. Picking up sorbents or sand with equipment may damage sites, although those exposed to swells or waves may already be reworked in the shallowest layers. The crisis atmosphere immediately following a spill could preclude adequate survey or site marking prior to cleanup. The impact potential depends upon the number of sites at the strand and the spill risk to particular shoreline segments. The Santa Barbara Channel shoreline is at the greatest risk for this type of impact. The impact to terrestrial sites from oil spill cleanup activities is expected to be low to moderate, and will be dependent upon the extent of the spill, the number of spills, and the area of activities.

Although several historically important lighthouses occur along the shoreline of the Sale area, it is not expected that visual or auditory intrusion will constitute a significant impact to these structures; i.e. additional industrialization would not affect the intrinsic historical value of these structures.

Land use change and resultant development is a potential impact on known and unknown cultural resources. Changes in the environmental context of an important site or structure could affect the resource. The degree of such impact will be dependent on the amount and especially the location of onshore development. There is a low probability of terrestrial resources being adversely affected in this way.

Contemporary Ethnic Groups. In the Santa Barbara Channel area, there is a moderate risk from oil spills to foodstuffs traditionally gathered by Native Americans. These foods, primarily found in the intertidal zone, include seaweed, abalone, mussels, sea anenomes, periwinkles, and various fish. Gathering is conducted locally both for ceremonial and subsistence uses.

Although not scientifically studied yet, it is known that extensive intertidal subsistence and recreational gathering of foodstuffs occurs through most of the Bight. This type of gathering is apparently a cultural phenomenon involving many different groups, including Mexican-American, Polynesian, Korean, Japanese, Cambodian, Vietnamese, and Filipino cultures. Although much of this gathering is illegal, for some families the intertidal zone is a major source of protein. Thus, an oil spill in any part of the Bight presents a potential impact to gathering activities. The risk is moderate to high.

In addition, any oil spill and associated cleanup activities in proximity to areas of spiritual concern to Native Americans would be considered by them to be spiritually intrusive. This type of intrusion is thought to be limited to the Santa Barbara Channel area. In this area, visual and auditory intrusion is of concern because there are several locales of spiritual importance to Native Americans. This type of impact has been a problem from previous industrial development. Point Conception, which has been nominated to the National Register of Historic Places, is particularly vulnerable to additional impact because of its great importance as a sacred site in Native American religion, and because it has previously been subjected to impact from industrial development. Since not all of the areas sacred to Native Americans are known to others, it is not possible to completely assess the potential impact of offshore oil and gas development on this type of resource. However, the only tract in Sale No. 68 with a predictable potential for impact on Point Conception is Tract No. 009.

ii. Mitigation: Proposed Lease Sale No. 68 encompasses 1,112,975 acres of seabed, much of it in very deep waters. The vast area and depths involved make any archaeological search very difficult. For these reasons archaeological investigation on the Pacific OCS is confined to the most sensitive area; i.e., water ≤ 120 meters deep. The primary method of investigation is remote sensing (magnetometer, sidescan sonar, subbottom profiler). On leases in water ≤ 120 meters deep, BLM requests that USGS invoke the Cultural Resources Stipulation, which requires a cultural resources survey be conducted in conjunction with the usual geohazards remote sensing survey. The methods by which this stipulation is implemented are specified by a periodically updated Notice to Lessees (NTL). NTL 77-3 is currently in effect. Recent (May 1980) industry prices for the cultural resources surveys range from $1500 to $17,000 per 9 square mile tract; mean survey price is $7125.

If leased, the following tracts are expected to require invocation of the Cultural Resources Stipulation: 9, 10, 13, 19, 43, 44, 49, 50, 51, 54, 55, 57, 58, 60, 61, 62, 66, 67, 68, 71, 72, 73, 74, 75, 78, 79, 80, 81, 82, 83, 84, 85, 86, 98, 99, 100, 101, 102, 103, 104, 107, 124, 130, 139. However, it is expected, based on past experiences with sales in this region, that most of the above tracts will probably not be leased under this proposal.

If potential cultural resources are identified as a result of the remote sensing survey, BLM will request that the operator: 1) avoid the object(s), or 2) identify the object(s) through additional investigation (e.g., remote camera, diving archaeologists) as something other than a cultural resource. Based on past experience with cultural resources in this area, BLM expects in most cases the lessee will choose the former alternative, avoidance. It is generally possible to easily avoid any potential resource without any necessity for further identification. Protection of cultural resources by avoidance is considered a professionally appropriate form of mitigation.

Some additional protection to cultural resources will be provided by the following USGS OCS Orders:

No. 1 - Identification of wells, platforms, structures, mobile drilling units, and subsea objects

No. 2 - Drilling Operations

No. 3 - Plugging and Abandonment of Wells

No. 5 - Production Safety Systems

No. 7 - Pollution Prevention and Control

b. Other Alternatives: If Alternative 2 is adopted, the impacts described under Alternative 1 would be increased slightly. Cancellation of Sale No. 68 would extend the preservation of most of the cultural resources subject to impact from the proposal. A delay of the Sale would result in a delay, but not an elimination, of any adverse effects on cultural resources. There is a remote possibility a delay would allow additional knowledge to be gained by research so that mitigation methods might be improved.

c. Conclusions: This proposal could commit some areas of relatively shallow waters of the OCS to a permanently disturbed condition. This proposal will place large and relatively permanent sources of magnetic anomalies on the OCS during the life of the proposed project by the presence of platforms, pipelines, and cables. After abandonment, remaining piling and well casing below the mudline will create large permanent magnetic anomalies. This will complicate or even preclude search for antiquities and modern objects (ships, aircraft, equipment) alike. Some anomalies may have to be investigated which are of no cultural value, but which may emulate the signature of resources. Because of the apparently wide distribution and the density of resources on the OCS, and because of the amount of industrial activity expected as a result of this proposal, it is nearly certain there will be some loss of historic and prehistoric archaeological sites on the OCS. There may be some loss of marine archaeological sites in State waters from pipelaying activities. However, the protective procedures discussed above will appropriately mitigate adverse impacts on marine cultural resources. These mitigative efforts should result in a low to moderate risk to marine archaeological sites.

Physical disruption will occur if construction or oil spill cleanup activities take place on undetected or ignored terrestrial archaeological sites. The severity of the impact would vary with the significance of the resource and the level of damage or disruption. However, State protective requirements probably would be mitigory in most cases. Thus the level of impact for terrestrial archaeological sites is expected to be low.

Both on and offshore, mitigation of possible impact on a site or object by salvage constitutes an irreversible and irretrievable loss of some of the information contained therein. As archaeological research, salvage, and analytical techniques improve, so does the amount and quality of information recoverable. Sites left undisturbed until more advanced technology and methodology by future archaeologists is used will likely yield greater data rewards. Similarly, conservation work by which materials and artifacts are restored improves steadily.

During the life of the proposal, the visual environment of some listed or eligible National Register sites may be adversely affected, but this is not expected.

Gathering activities by contemporary ethnic groups could be decreased as a result of oil spill(s). There is a moderate to high expectation of this type of impact, although the results of such an impact are expected to be low to moderate. Such impacts are expected to be temporary, but the indirect effects on the individuals and groups engaged in such activities could be long term.

Depending on the location of industrial activities resulting from this proposal, the adverse effects on areas sacred to Native Americans is expected to be low to moderate.

d. Cumulative Impacts: Cumulative effects are expected to be most severe in the Santa Barbara Channel region, where oil and gas exploration and development has occurred with relatively high intensity. The more intense and extensive the industrial activities, the greater the effect on cultural resources. The greatest cumulative effect on a terrestrial resource is predicted for Point Conception, which is important to contemporary Native Americans for cultural and spiritual reasons. Point Conception has been previously impacted by both terrestrial and marine development. Native American concern is quite high that additional impacts be avoided. The net effect of additional OCS impacts on cultural resources will, in part, be dependent upon the application of mitigative efforts. Some minimal positive effects could result from a general increase in the knowledge of cultural resources because of survey work conducted in conjunction with exploration and development.

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20. Visual Resources

a. Alternative 1: Social, economic, cultural and philosophic backgrounds greatly vary one's perception of esthetic values. The sight of an offshore drilling platform may significantly decrease one observer's enjoyment of the coast, while another would be unaffected. In this analysis we have identified, from a landscape-architectural standpoint, the nature of visual resource impacts.

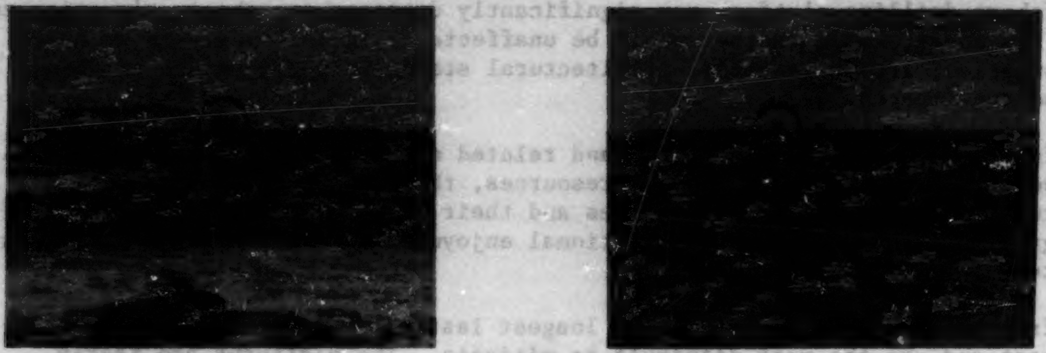
Offshore oil and gas development and related onshore support facilities will have an adverse impact on visual resources, the degree depending upon the nature and number of the facilities and their location. Visual resource degradation could decrease recreational enjoyment of the beaches and coastal waters for some people.

Offshore platforms will cause the longest lasting, most prominent visual impact and are the most difficult to mitigate. The platforms are fairly prominent objects exhibiting discordant vertical and angular lines against the soft plane of the sea (see Figure IV.C.20-1). Portions of a 190-foot platform structure may be seen from the water's edge if it is located within 17 miles of the shoreline. From elevated vantage points, the visual range increases in proportion to elevation. At distances beyond about 15 miles, the size of platforms would appear very small and may be obscured by natural sea haze from 40 to 60 percent of the time. Dense fog and haze may obscure platforms situated at the 3-mile limit up to approximately 22 percent of the time, depending upon local climatic features (Naval Weather Service, 1976). For additional information on OCS structures see Section IV.A.2.

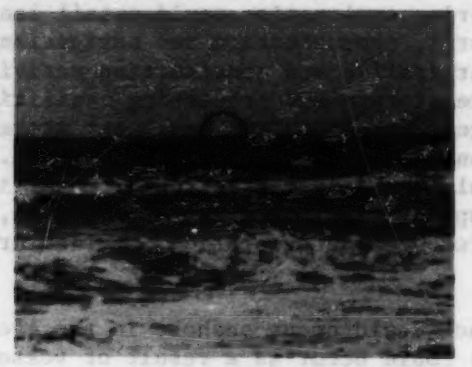
Onshore visual impacts during exploration could entail land use changes for equipment storage, heliports, communication and navigation equipment facilities, increased vehicular traffic and construction activities. During the development stage, onshore storage and processing facilities, pipeline installation, pipeline and barge fabrication and equipment storage yards will all involve some deterioration of the visual resource onshore. Sensitive design, siting, choice of materials and landscaping could reduce the visual impact of these installations. Despite these potential mitigations, there is a possibility of some visual resource deterioration, particularly in undeveloped areas.

A significant visual impact could occur onshore in the event of a major oil spill. Accidental spills could occur as a result of vessel loss, production equipment failure, pipeline ruptures and well blowouts. Some low-level spillage will occur during the course of normal operations. The duration of oil fouling on the beaches ranges from a few days to years, depending upon the type and amount of spillage, extent of cleanup efforts, beach sand transport mechanisms, oil composition, etc. Any oil fouling of beaches would have an adverse effect on visual quality until the oil is recovered by either cleanup efforts or natural processes.

An effort to quantify the impacts of various OCS-related structures on the aesthetics of the Sale No. 68 area can be found in Technical Paper 81-5.



3 Miles from Platform **5 Miles from Platform**



10 Miles from Platform

Figure IV.C.20-1 Visual Impact of Oil Platforms

The scenarios used in the analysis assume one platform, four platforms, an Offshore Storage and Treatment vessel (OS&T), a 5-acre processing plant and a 25-acre supply base. These scenarios have been analyzed for potential impact on each landscape unit of the California coast based on the existing condition of the unit.

b. Other Alternatives: The reduction in potential impact due to the deletion of the tracts in the Channel Island National Marine Sanctuary would be mainly restricted to the view from the Channel Islands. This is due to the tracts in question being within 6 miles of the Islands. Therefore, deleting these tracts would remove any potential visual disruption for the area and leave it with the present aesthetic rating. The mainland viewshed would retain the impact of the total Sale, as any potential platforms which would be removed by the deletion, are beyond the general viewshed except for the area northeast of Anacapa Islands. The reduction in impact would also be noticed in a lessening of a potential oil spill impacting the island; however, this is mainly due to an increase in time of any spill reaching the beach.

Delaying the Sale would postpone potential impacts, and it is possible that during such a delay there would be an improvement in safety and cleanup equipment, which would lower the potential impact. Cancelling the Sale would, of course, eliminate all Sale-related impacts.

c. Conclusions (Alternative 1): Due to individual differences in perception, the magnitude of the potential visual resource impact cannot be taken as a fixed value, but must be used as a guide. For most observers, it is believed that Sale No. 68-related development would cause a visual degradation in those areas where development occurs. The amount of this degradation will vary with the location and type of OCS-related facility and the shoreline area this impacts. The shoreline segments with a present high rating will drop at most into the medium-high category. Those with a present medium-high rating will either stay in the category or drop to the medium classification, and those rated medium, or lower, will tend to remain unchanged in their aesthetic rating. (For exact changes for each landscape unit, see POCS Technical Paper No. 81-5.)

d. Cumulative Impacts (Alternative 1): Cumulative impacts to the visual resources would come from three main sources: spilled oil, offshore platforms or onshore facilities. Spilled oil could appear in the area from such sources as tankers, existing platforms and pipelines, sewage discharges, and natural seeps. Of these, the most important are sewage discharge and natural seeps, which together discharge over 1,700 barrels of oil into the Southern California Bight every day. This oil can appear on the beaches in the form of tar balls and oil sheens and as such, detracts from the beauty of the beach. There are at present 9 platforms and 7 artificial islands in State waters and 11 platforms and one OS&T in Federal waters off Southern California, and these have to be included in the aesthetics of the region in regard to future development. Onshore facilities are expected to remain at about present levels as there are already facilities in the area to handle Sale No. 68 requirements. These potential impacts have already been incorporated into the analysis as is seen in POCS Technical Paper No. 81-5, except the impact of the spilled oil, which could have a large impact if it becomes a major spill.

21. **Unavoidable Adverse Impacts:** There will be some unavoidable adverse impacts to the marine biological community. Oil spills constitute the greatest risk to biota. The impact to intertidal biota is expected to be low to moderate, although it is potentially greater in especially sensitive areas (e.g., Santa Barbara Island, Santa Rosa Island, and portions of San Nicolas Island). The greatest risk to the subtidal benthos is along the Santa Rosa Cortes Ridge including Tanner and Cortes Banks and to the rocky outcrops off Point Conception. Although unlikely, impact to estuaries would be high if spilled oil entered. There is an unknown cumulative risk to the sensitive Channel Islands area.

In the event of a spill, low to moderate ecological losses are expected for surface fishes and temporary economic losses will be incurred by the fishing industry. Impacts from oil spills probably would be greatest in the Inner Banks since this area encompasses the region's most productive fishing grounds and ports. Manmade structures could impact fish and fisheries if they disrupt the critical habitat of a species. It is not possible to determine how significant this impact will be. Mud mounds and trenches from the anchors of pipe-laying barges probably will create a high impact to commercial trawlers in the Santa Barbara Channel unless a way is found to resolve this conflict. The impact of trace metals in drilling muds on fish and fisheries is unknown, but could be avoided if drilling muds and cuttings are barged ashore. Vessel traffic, particularly seismic boats, may temporarily cause moderate impacts to the commercial fishing industry, but these impacts could be reduced with proper coordination.

In areas developed, it is expected there will be some decrease in visual values. Some impact to recreation is expected in the event of any oil spill, and the magnitude of the spill will be positively correlated with the impact on recreation.

It is expected that there will be an unavoidable loss of marine archaeological sites, despite mitigating efforts. Such loss will affect both historical and prehistoric sites. It is also possible there will be some effect on subsistence and spiritual activities of the contemporary Native American community. Risk to other ethnic groups is lesser.

It is expected that air quality will be decreased in those areas already exceeding the air quality standards.

22. **Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity:** The extraction and consumption of mineral resources would preclude their use in the future and reduce the total reserves. However, should this proposal result in the discovery of additional recoverable resources, known reserves would be increased. Such a discovery could increase the impacts to various resources presently subject to potential risk.

During exploration and production there will be limited interference with the longer-term uses of the environment, such as commercial fishing and recreation.

Temporary impacts to marine communities would result from construction and operation of offshore facilities. Short-term losses would include an anticipated, but unquantifiable, reduction in biological productivity, changes in marine habitats, reduction in populations of plankton, nekton, fish, benthos, birds, mammals, and modification of the food web.

Onshore development and Sale-related jobs will cause some population increases and shifts. Long-term socio-economic changes are expected to be slight.

After the completion of oil and gas production, oil spill impacts will not occur, and the marine environment is generally expected to remain at, or return to its normal long-term productivity levels. It has been recognized that continuous low level pollution from toxic chemicals, including oil, may adversely affect long-term productivity. However, there has been as yet no discernible decrease in long-term marine productivity in the Sale area. Until more reliable data becomes available, the long-term effects of the chronic and major spillage of hydrocarbons cannot be accurately projected.

Losses of cultural resources will be permanent as these resources are nonrenewable.

In summary, short-term environmental and socio-economic impacts would result from the proposal. Hydrocarbon reserves would be lowered, although there is the possibility of an increase in known reserves if additional discoveries are made. Some permanent loss of cultural resources is expected. Few long-term productivity or environmental gains are expected as a result of this proposal. Although there may be some increase in environmental knowledge, the benefits principally expected are those associated with a medium-term increase in supplies of domestic hydrocarbons.

23. Irreversible and Irretrievable Commitment of Resources: Leasing of tracts included in proposed Lease Sale No. 68 would permit development and extraction of the hydrocarbon resources contained therein. The USGS estimates net recoverable reserves of 121 million barrels of oil and 280 billion cubic feet of gas. Leasing of the proposed tracts and their subsequent development could result in an irreversible and irretrievable commitment of these resources.

Industrial development in support of offshore development could include the following terrestrial facilities: temporary or permanent service bases, maintenance yards, general shore support, platform and pipeline support, pipelines, landfalls, and marine terminals.

While land usage may be long term, it is not generally considered irreversible. However, where new land uses result in the disruption or destruction of natural features or processes such that return to the previous land use is not possible, an irreversible commitment of resources would ensue. Groundwater depletion could disrupt water supply capabilities, resulting in an irreversible situation, unless other supply sources are obtained.

CHAPTER V

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CHAPTER VI

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Chapter VII

VII. CONSULTATION AND COORDINATION

A. Development of the Proposal

Proposed OCS Sale No. 59 is one of the proposed OCS Sales included in the Five Year OCS Oil and Gas Leasing Schedule. Coordination with other governmental agencies, industry, and the public regarding this proposal began in May, 1979.

Consultation and coordination relative to any proposed OCS Sale is an ongoing process which involves 10 major steps. These ten steps (OCS Planning Schedule, Request for Resources Reports, Call for Nominations and Comments, Tentative Tract Selection, Scoping Meetings, Draft Environmental Impact Statement and subsequent public hearings, Endangered Species Consultation Final Environmental Impact Statement, Coordination with the State and Notice of Sale) involve very extensive contact and interaction with Federal, State and local government, special interest groups and the general public. Each of these steps is discussed in detail in Section I.B.2. This section will not reiterate that information. Supplemental information is presented which summarized the additional consultation and coordination which has taken place between specialists on a staff level.

B. Development of the DEIS

During preparation of this DEIS, Federal, State and local agencies, industry, and the public have been consulted in order to obtain descriptive information, to identify significant impacts and issues, and to identify effective mitigating measures and reasonable alternatives to the proposal. Information and comments received during the development of the proposal (described in Section A above) were used in preparation of the DEIS. In addition, scoping meetings were held following tract selection, with Federal, State, and local agencies and the public in order to identify more clearly and specifically, issues and alternatives to be studied in the DEIS. A description of the scoping process and its results can be found in Section I.B.2.e.

Departmental Manual Part 655 DM 1 details procedures for intradepartmental coordination regarding OCS oil and gas leasing. In accordance with these procedures, departmental agencies with interest and expertise were consulted in the development of the lease stipulations for this proposal (Section I.B.7.).

Pursuant to Section 7 of the Endangered Species Act, formal consultation must take place between BLM, the Fish and Wildlife Service (FWS), and the National Marine Fisheries (NFS). This process was initiated with FWS on January 13, 1981 and NMFS on January 16, 1981. The FWS opinion appears in Appendix E and NMFS opinion appears in Appendix F.

C. Consultation With Agencies, Organizations and Other Interest Groups During the Development of the Proposal and DEIS

Federal Agencies

U.S. Department of Agriculture
  Forest Service

U.S. Department of Commerce
  National Oceanic and Atmospheric Administration
  National Marine Fisheries Service

U.S. Department of Defense
  Pacific Missile Test Center
  Department of the Navy

U.S. Department of Energy

U.S. Department of the Interior
  Fish and Wildlife Service
  Geological Survey
  National Park Service

U.S. Department of Transportation
  11th Coast Guard District
  Coast Guard Post Safety Station

Environmental Protection Agency

Marine Mammal Commission

State Agencies - California

Air Resources Board
Clearing House
Coastal Commission
Department of Fish and Game
Division of Mines and Geology
Lands Commission
Governor's Office of Planning and Research
Parks and Recreation
Water Resources Control Board

Counties

County of Los Angeles
County of Orange
County of Riverside
County of San Bernardino
County of Santa Barbara
County of Ventura

Cities

- City of Avalon
- City of Carlsbad
- City of Carpinteria
- City of Coronado
- City of Del Mar
- City of El Segundo
- City of Port Hueneme
- City of Huntington Beach
- City of Imperial Beach
- City of Laguna Beach
- City of Long Beach
- City of Los Angeles
- City of Manhattan Beach
- City of Newport Beach
- City of Oceanside
- City of Ojai
- City of Ontario
- City of Oxnard
- City of Rancho Palos Verdes
- City of Riverside
- City of San Clemente
- City of San Diego
- City of San Juan Capistrano
- City of Santa Monica
- City of Seal Beach
- City of Ventura
- City of Yorba Linda

Academic

- Cabrillo Beach Museum
- California Polytechnical University
- California State University
- Orange Coast College
  - Department of Ocean Science
- Pasadena City College
- San Diego Community College
- Southern California Academy of Sciences
- Southern California Coastal Water Research Project
- University of California
  - San Diego, Scripps Institution of Oceanography
  - Sea Grant Program
- University of Southern California
  - Department of Petroleum Engineering
  - Institute for Marine and Coastal Studies
  - Sea Grant Program
  - School of Urban and Regional Planning

D. Review of the DEIS

This DEIS will be available for review by Federal, State, and local agencies and the public. All comments and information received will be considered during preparation of the FEIS.

The DEIS has been distributed to those federal agencies with interest or expertise pertinent to OCS oil and gas leasing, to State and local governments in the affected States, to organizations and individuals having an interest in the proposal, and is available to the public on request from the BLM's New York OCS Office and Washington Office.

Federal and state agencies from which comments have been requested include the following:

- U.S. Department of Commerce
  - National Oceanographic and Atmospheric Administration
    - National Marine Fisheries Service
      - Office of Coastal Zone Management
- U.S. Department of Defense
  - Army Corps of Engineers
  - Department of the Navy
- U.S. Department of Energy
  - Federal Energy Regulatory Commission
  - Office of Leasing Policy Development
  - Nuclear Regulatory Commission
- U.S. Department of State
- U.S. Department of the Interior
  - Fish and Wildlife Service
  - Geological Survey
  - National Park Service
- U.S. Department of State
- U.S. Department of Transportation
  - Coast Guard
  - Office of Pipeline Safety Operations
  - Office of Safety Affairs
- U.S. Environmental Protection Agency
- Marine Mammal Commission

- State Agencies - California
  - Air Resources Board
  - Clearing House
  - Coastal Commission
  - Department of Fish and Game
  - Division of Mines and Geology
  - Lands Commission
  - Governor's Office of Planning and Research
  - Parks and Recreation
  - Water Resources Control Board

Staff Consultation

Supplemental information presented below summarizes the consultation and coordination which has taken place between specialists on a staff level.

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	Lt. Commander J. Felton USCG 10/80
	R. Bates Crowley Maritime 10/80
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CHAPTER VIII

VIII. APPENDICES

A. Approvals, Certifications, and Permits

Federal, State, and local authorizations that must be obtained to implement the proposed action are given below. (Also see Section I.B.3, Regulatory Framework.)

1. Federal Agencies

a. Department of the Army (Section 10 of the River and Harbor Act of 1899): The Corps of Engineers issues construction permits to conduct exploratory drilling of oil and gas wells and to construct platforms, production facilities, and pipelines. The Corps of Engineers has the responsibility to consider all matters affecting navigation and national security.

b. Department of the Interior, Bureau of Land Management (43 CFR 3340): The Bureau of Land Management (BLM) grants right-of-way permits on the Outer Continental Shelf (OCS) for BLM pipelines which are not wholly contained within boundaries of a single lease, the boundaries of unitized leases, or the boundaries of contiguous (not cornering) leases of the same owner or operator.

c. Department of the Interior, Geological Survey: The Geological Survey (USGS) approves 1) Exploratory Plans and accompanying Environmental Reports, 2) Development and Production Plans and accompanying Environmental Reports, 3) application of permit to drill, deepen, or plug back wells, and 4) right of use and easement on the OCS to construct and maintain platforms, artificial islands, GS pipelines (other than BLM pipelines) and other devices which are permanently or temporarily attached to the seabed (30 CFR 250).

USGS issues permits for construction and operation of all oil and gas equipment on the OCS that could emit air pollutants. They also determine exemptions for certain equipment and facilities, and enforce limitations on existing, new, or modified sources (Clean Air Act Amendments of 1977 and OCS Lands Act Amendments of 1978).

d. Department of Transportation (33 CFR 67): The Coast Guard approves applications for Private Aid to Navigation. The Coast Guard promulgates and enforces regulations on lights and other warning devices, safety equipment and other matters relating to safety of life and property.

e. Environmental Protection Agency (Federal Water Pollution Control Act - 33 U.S.C. 1251. seq.; and 40 CFR 125): The Environmental Protection Agency (EPA) issues the National Pollution Discharge Elimination System Permits for oil and gas operations prior to well drilling. EPA is responsible for the discharge of pollutants from point sources, into navigable water, the contiguous zone, and the ocean.

READEX FICHE best copy available

f. Federal Communications Commission (Federal Communication Act of 1934, U.S. Title Code 47): The Federal Communication Commission issues the license for radio communication equipment.

g. Federal Energy Regulatory Commission (FERC) (Natural Gas Policy Act of 1978, 92 Stat. 3350): FERC issues certificate of public convenience and necessity for construction and operation of natural gas facilities.

2. State of California

a. California Coastal Commission issues a certification of Consistency with the approved State of California Coastal Zone Management program (Section 306 of the Coastal Zone Management Act of 1972 [16 U.S.C. 1455]).

California Coastal Commission also issues permits for pipeline construction from the 3-mile limit offshore to coastal zone jurisdiction inland (California Coastal Zone Conservation Act of 1972 [Proposition 20]).

b. California Public Utilities Commission issues encroachment permits for pipeline crossings of railroads and utility rights-of-way.

c. Division of Industrial Safety issues permits for trenches concerning onshore pipeline construction.

d. Department of Parks and Recreation issues encroachment permits for pipeline construction across State-owned beaches.

e. Department of Transportation Division of Highways issues permits for road turnout construction on highways and pipeline crossings of highways.

f. Solid Waste Management Board issues permits for disposal of soil and hazardous waste material.

g. State Land Commission issues rights-of-way leases across State Lands for construction of pipelines (Division 6 of the Public Resources Code and Title 2, Division 3, of the California Administrative Code).

h. State Water Resources Control Board issues permits for wastewater discharge and surface drainage.

3. Local Governments

a. Air Pollution Control District issues permits to construct and operate oil and gas treatment facilities within the county jurisdiction and out to the 3-mile limit.

b. County Department of Transportation issues permits for road excavation and encroachment permits for pipeline construction.

c. Approvals from other County Departments.

d. Approvals, certifications, and permits for the City authorities.

B. Glossary

Acute	-	short term.
Anadromous fish	-	fish that migrate up rivers from the sea to breed in fresh water.
Anomaly	-	deviation from normal condition.
Anthropogenic	-	coming from human sources.
Benthic	-	bottom dwelling.
Benthic macroinvertebrate	-	animals such as worms, clams, or crabs which are large enough to see without the aid of a microscope.
Biomass	-	weight of living organisms.
Carrying capacity	-	the maximum number or weight of individuals that can exist in a given habitat.
Cetacean	-	any of an order (Cetacea) of aquatic mostly marine mammals including the whales, dolphins, porpoise and related forms with large head, fishlike nearly hairless body, and paddle-shaped forelimbs.
Critical habitat	-	an area that is essential to the conservation of a species.
Demersal	-	bottom dwelling.
Endangered	-	refers to any species which is in danger of extinction throughout all or a significant portion of its range and has been officially listed by the appropriate Federal or State agency; a species is determined to be endangered (or threatened) because of any of the following factors: a) the present or threatened destruction, modification, or curtailment of its habitat or range; b) over-utilization for commercial, sporting, scientific, or educational purposes; c) disease or predation; d) the inadequacy of existing regulatory mechanisms; or e) other natural or man-made factors affecting its continued existence.

Epibenthic organism	-	those organisms attached to, or living on a substrate as opposed to those which burrow and live in the substrate.
Epiphyte	-	a plant growing attached to another plant.
Fauna	-	animals, especially the animals of a particular region or time.
Fledge	-	to rear until ready for flight or independent activity.
Fledgling	-	a young bird just fledged.
Flyway	-	an established air route of migratory birds.
Gross regional product	-	total value added generated from all sectors in the regional economy including government and households. (See value added.)
Haul-out area	-	specific locations where pinnipeds come ashore and concentrate in numbers to rest, breed, and/or bear young.
Hypothermia	-	subnormal temperature of the body, usually due to excessive heat loss.
Indirect (socio-economic) effects	-	caused by auxiliary activities to an action. Related only indirectly to the action.
Induced (socio-economic) effects	-	caused by activities which are stimulated by an action but not directly related to it.
Jobs	-	the number of full-time and part-time positions. It does not equal the number of persons employed, since there could be multi-job holders.
Mariculture	-	the breeding or growth of marine animals and plants to increase their stocks.
Microcrustacean	-	any relatively small crustacean (may range from microscopic to a few inches in size) including organisms such as shrimp, crabs, beach hoppers (amphipods) copepods and other similar groups.
Mysids	-	small shrimp like organisms.

Ovoviviparous	producing eggs that hatch within the female's body.
Phytoplankton	plant (photosynthetic) plankton.
Pinniped	any of a suborder (Pinnipedia) of aquatic carnivorous mammals (e.g., seals, sea lions) with all four limbs modified into flippers.
Purse seine	a fishing seine that is pursed or drawn into the shape of a bag to enclose the catch.
Rare	refers to any species whose continued existence is threatened by one or more conditions and has been officially listed by the appropriate State agency; a species is determined to be rare because of any of the following conditions: a) the species is confined to a relatively small and specialized habitat and is incapable of adapting to different environmental conditions; (b) the species, although found in other parts of the world, is nowhere abundant; c) the species is so limited that appreciable reduction in range, numbers, or habitat would cause it to become endangered; or d) the species would become endangered if current management and protection programs were diminished to any degree.
Rookery	the nesting or breeding grounds of gregarious (i.e., social) birds or mammals; also a colony of such birds or mammals.
Subtidal	generally considered to be that part of the ocean bottom not uncovered by tidal action.
Threatened	refers to any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and has been officially listed by the appropriate Federal agency; criteria for determination of threatened status can be found under "endangered".
Trawl	a large, tapered fishing net of flattened, conical shape that is typically towed along the sea bottom.

Trophic	-	feeding, trophic levels refer to the hierarchy of organisms from photosynthetic plants to carnivores such as man.
Upwelling	-	movement of subsurface water to the surface of the ocean, caused by meteorological and physical phenomena.
Value added	-	for a given enterprise, the market price of goods completed, less the cost of purchased materials. Gross value added includes compensation to employees, profits, taxes, rents, interest, and reserves for depreciation.
Xenobiotic	-	compound not usually associated with living organisms.
Zooplankton	-	animal plankton, dependent on phytoplankton for food source.

C. Abbreviations

ANS	Alaska North Slope
API	American Petroleum Institute
ASBS	Areas of Special Biological Significance
BAST	Best Available and Safest Technologies
BCDC	Bay Conservation and Development Commission
BLM	Bureau of Land Management
BOD	Biological Oxygen Demand
BP	Before Present
CARB	California Air Resources Board
CCC	California Coastal Commission
CDFG	California Department of Fish and Game
CEIP	Coastal Energy Impact Program
CEP	Council of Environmental Protection
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CMP	Coastal Management Program
COD	Chemical Oxygen Demand
CZMA	Coastal Zone Management Act
DEIS	Draft Environmental Impact Statement
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOJ	U.S. Department of Justice
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERG	Environmental Resources Group
FACSFAC	Fleet Area Control and Surveillance Facility
FWPCA	Federal Water Pollution Control Act
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulation Commission
FWPCA	Federal Water Pollution Control Act
FWS	U.S. Fish and Wildlife Service
GS (also USGS)	U.S. Geological Survey
IMCO	Intergovernmental Maritime Consultative Organization
IPP	Intergovernmental Planning Program
LA	Los Angeles
LB	Long Beach
LCP	Local Coastal Plan
LNG	Liquified Natural Gas
LUP	Land Use Plan
MIT	Massachusetts Institute of Technology
MTB	Materials Transportation Bureau
NAAQS	National Ambient Air Quality Standards
NCR	Nuclear Regulatory Commission
NEPA	National Environmental Policy Act
NGPA	National Gas Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant and Discharge Elimination System
NR	Not reported

NTL's	Notices to Lessees and Operators
OCS	Outer Continental Shelf
OS&T	Offshore Storage and Treatment
PA	Precautionary Area
PAR	Port Access Route
PMTC	Pacific Missile Test Center
PSD	Prevention of Significant Deterioration
RTWGs	Regional Technical Working Groups
SB	State Beach
SBAPCD	Santa Barbara Air Pollution Control District
SCAQMD	South Coast Air Quality Management District
SCB	Southern California Bight
SCE	Southern California Edison
SDAPCD	San Diego Air Pollution Control District
SID	Secretarial Issue Document
SMB	Single Mooring Buoy
SP	State Park
SSF	Shipping Safety Fairway
TSS	Traffic Separation Scheme
UC	University of California, Irvine
USC	University of Southern California
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS (also GS)	U.S. Geological Survey
VOC	Volatile Organic Compounds
WSMC	Western Space and Missile Center

D. Units of Measure

B/D = barrels per calendar day
Btu = British thermal unit
bbls = barrels
BP = years before present
bcf = billion cubic feet
cm = centimeter
dBA = decibels audible
dwt = dead weight ton
ha = hectares
hr = hour
km = kilometer
l = liter
lb. = pound
m = meter
maxi. = maximum
mg = milligrams
mgd = million gallons per day
MW = megawatt
MWe = megawatts (electric)
ng = nannogram
nm = nautical mile
PPB = parts per billion
pphm = parts per hundred million
PPT = parts per thousand
sp. = species
ug = microgram
0/00 = parts per thousand

Appendix E

Fish and Wildlife Service - Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

ADDRESS ONLY THE DIRECTOR
FISH AND WILDLIFE SERVICE

RECEIVED
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BUREAU OF LAND MANAGEMENT

In Reply Refer To:
FWS/OES BLM/GS 81-1

APR 29 1981

Memorandum

To: √ Director, Bureau of Land Management
Director, U.S. Geological Survey

From: Associate Director

Subject: Section 7 Biological Opinion, Proposed Outer Continental Shelf Oil and Gas Leasing and Exploration in the Southern California Bight (OCS Sale No. 68)

By memorandum of January 13, 1981 (copy attached), the Bureau of Land Management (BLM) and the U.S. Geological Survey (GS) requested joint formal consultation on the proposed leasing of the Southern California Outer Continental Shelf (OCS) for oil and gas exploration as indicated in the 5-Year Leasing Schedule released in June 1980. The proposed lease sale in the Southern California Bight (SCB) region is Sale No. 68. This consultation includes all existing OCS activities, Sale No. 68 activities pertaining to OCS oil and gas leasing and exploration in the area of southern California from Point Conception south to the U.S./Mexico border and additional OCS sales anticipated for this area through 1984. In May 1978, the GS requested a formal Section 7 consultation and on November 1, 1979, received a biological opinion on a previous SCB Lease Sale (Sale No. 48).

In response to your request, a consultation team was appointed by memorandum of February 6, 1981 (copy attached), to assist me in determining whether the proposed OCS sale and subsequent exploration are likely to jeopardize the continued existence of species which are federally listed as Endangered or Threatened or result in the destruction or adverse modification of Critical Habitat.

On February 17 and 18, 1981, the Fish and Wildlife Service (FWS) consultation team met with your representatives and representatives from the National Marine Fisheries Service (NMFS) to discuss the proposed leasing and exploration (see attached attendance list). Through prior correspondence between the FWS and the Pacific OCS Office (POCS), it was determined that the listed species which may be affected by the proposal and that fall under the jurisdiction of the Department of the Interior are as follows: southern sea otter (Enhydra lutris nereis), brown pelican (Pelecanus occidentalis), California least tern (Sterna albifrons browni), American peregrine falcon (Falco peregrinus anatum), bald eagle (Haliaeetus leucocephalus), California condor (Gymnogyps californianus), light-footed clapper rail (Rallus longirostris levipes), Santa

Barbara song sparrow (Melospiza melodia graminea), San Clemente sage sparrow (Amphispiza belli clementeae), San Clemente loggerhead shrike (Lanius ludovicianus mearnsi), Island night lizard (Klauberina riversiana), Palos Verdes blue butterfly (Glaucopsyche lygdamus palos verdesensis), El Segundo blue butterfly (Euphilotes [=Shijimiaeoides] battoides allyni), San Clemente broom (Lotus scoparius ssp. traskiae), San Clemente Island bush-mallow (Malacothamnus clementinus) San Clemente Island larkspur (Delphinium kinkiense), San Clemente Island Indian paintbrush (Castilleja grisea), salt marsh bird's beak (Cordylanthus maritimus ssp. maritimus), and Critical Habitat for the American peregrine falcon, California condor, and the Palos Verdes blue butterfly.

There are no proposed species in the project area. After reviewing the proposed activities and biological data on the above species, we have determined that the following species will not be affected because they are outside the area expected to be impacted by the proposed oil and gas leasing and exploration activities: the California Condor and its Critical Habitat, San Clemente loggerhead shrike, San Clemente sage sparrow, San Clemente broom, San Clemente Island bush-mallow, San Clemente Island larkspur, San Clemente Island Indian paintbrush, and the Island night lizard. Because they will not be affected, they were not considered in this consultation.

There is general agreement among ornithologists who have searched for song sparrows on Santa Barbara Island during the breeding season that the Santa Barbara song sparrow is extinct. Therefore, the Santa Barbara song sparrow is not considered in this consultation. Should new information indicate that this species may occur on Santa Barbara Island, Section 7 consultation will be required if a "may affect" determination is made.

The consultation team reviewed numerous reports, publications, and other information including the Final Environmental Impact Statement for Sale No. 48 and the draft Oilspill Risk Analysis (OSRA) for the Southern California (Proposed Sale No. 68) Outer Continental Shelf Lease Area, GS Open File Report 80. On February 19, 1981, a member of the consultation team met with Frank Gress and Dan Anderson in Davis, California, to discuss oil and gas leasing, exploration, and development in the SCB relative to the listed brown pelican. In addition, numerous telephone contacts were made with knowledgeable experts. Copies of pertinent reports, documents, and records are maintained in an administrative record at the Office of Endangered Species (OES) and are incorporated by reference in this opinion.

Project Description

BLM acts as the Secretary of the Interior's agent in arranging for and processing bids on offshore oil and gas lease sales. After the issuance of the leases, GS assumes the authority to administer the lease areas. Among other things, this includes the approval of exploratory and development/production plans submitted by the lessee.

As per your January 13, 1981, request for a regional consultation on the OCS oil and gas program in the SCB, this biological opinion considers all existing operations pertaining to oil and gas leasing and exploration in the offshore area from Point Conception south to the U.S./Mexico border and the planned OCS Sale No. 68, and additional sales anticipated in this area through June 1984. Although this consultation considers the proposed sales through June 1984, BLM and GS should remain in close contact with OES to insure that new circumstances which may develop do not impact listed species and that agency obligations to conserve listed species are effectively met. OES concurs with BLM's contention that future sales proposed for this region constitute new information and that formal consultation should be reinitiated at the appropriate time. Should new species be listed which may be affected, this consultation should be reinitiated. In addition, BLM and GS are required to confer with OES if species which may be impacted by OCS activities are proposed for listing as Endangered or Threatened.

Lease Sale No. 68 consists of 218 blocks with a total area of about 1,112,975 acres (445,190 hectares), to be offered for lease in June 1982. BLM has indicated that a reduction in the number of tracts offered in Lease Sale No. 68 can be expected before the actual sale takes place. Included within such a reduction would be 11 complete tracts and portions of 26 others which are contained within the Channel Islands National Marine Sanctuary because leasing would conflict with the sanctuary status. However, in the March 30, 1981, Federal Register (46 FR 19227), the National Oceanic and Atmospheric Administration (NOAA) published a Notice of Deferral regarding regulations which would prohibit hydrocarbon development within the Sanctuary, pending reconsideration in accordance with Executive Order 12291. Oil and gas activities within the Marine Sanctuary near Anacapa Island would increase the degree of threat from oilspills to brown pelicans breeding on the Island.

The tracts being offered for lease comprise three subareas: the Santa Barbara Channel containing the Western and Eastern Santa Barbara Channel; the Inner Banks containing the Anacapa Area, Santa Monica Basin and the San Pedro Area; and the Outer Banks containing the area south of Santa Rosa Island, San Nicholas Basin, Dall Bank, Southeast Tanner Bank and Santa Tomas Knoll. The tracts range from Point Conception to south of San Clemente Island and lie in waters from about 150 to 4,900 feet (46 to 1,500 meters) deep. The tracts are no closer than 3 statute miles from shore and range seaward to 84 miles. A draft Environmental Impact Statement (EIS) on this proposed Sale is scheduled for publication in May 1981, with a final EIS scheduled for release in November 1981.

Exploration of the OCS requires certain onshore support facilities including office space, helicopter and/or fixed-wing aircraft facilities, docks for boating activities, and supply bases. Due to the uncertain nature of oil exploration, companies are generally unwilling to construct new facilities to support exploration activities and usually prefer to utilize existing areas and facilities. At present, the numerous onshore facilities in southern California which are being used for Sales Nos. 35, 48, and other exploration activities will support any proposed new exploration.

There is a possibility of oilspills occurring during the exploratory phase of OCS activity. Spills may be from two sources: 1) small spills which occur during the handling of fuel oil, and 2) blowouts of exploratory wells. The first source is minor and is not expected to result in any noticeable increase in oil pollution. Therefore, this impact is considered negligible. A blowout, however, can cause the release of significant amounts of hydrocarbons into the marine environment and may affect listed species. The Campeche, Mexico, oilspill is a dramatic example of an exploration blowout. While the exact causes of the Campeche blowout are likely to remain unknown, it appears that operational procedures, rather than technology, were at the root of the accident. It is thought that this spill could have been avoided had operating procedures used in the United States been employed.

In the United States, OCS Operating Orders require that a number of safety devices and procedures be employed to prevent such an accident. These include the use of blowout preventers, strict drilling procedures, regular testing of safety equipment, training of personnel, regular inspection by GS personnel, and approval by GS of all drilling plans and modifications. According to statistics compiled by GS, the probability of a blowout occurring during exploration in the offshore waters of the United States is remote.

This biological opinion considers all existing OCS operations pertaining to oil and gas, the leasing and exploration phases of planned OCS Sale No. 68, and proposes sales in the SCB area through June 1984 and assumes that existing onshore facilities will continue to be utilized for exploration activities. Should the use pattern of these facilities be changed or additional onshore facilities be required which may affect listed species or their habitats, you must reinitiate consultation. Development and production phases are included only in an advisory and cumulative sense. Should exploration activities reveal the presence of significant amounts of hydrocarbons, this consultation must be reinitiated prior to entering the development and production phases of OCS activities.

BIOLOGICAL ACCOUNTS

Accounts of the biological information considered in this biological opinion follow:

American Peregrine Falcon (Falco peregrinus anatum)

The American peregrine was listed as Endangered on June 2 and October 13, 1970, and a portion of the peregrine's Critical Habitat was designated in the August 11, 1977, Federal Register. This subspecies once occurred widely throughout much of North America from southern Alaska and Canada, to northern Mexico. This peregrine is migratory in the northern portion of its breeding range, but exhibits less migratory behavior toward the southern portion of its range. In California, the species once occurred throughout the State where cliff faces and steep rocky slopes provided suitable nesting locations. The mountains, sea coast, and Channel Islands historically harbored significant populations.

The principal cause of the peregrine's decline has been contamination by chlorinated pesticides. Other factors contributing to the birds' decline include shooting, predation, egg collection, disease, falconers, human disturbance at nesting sites, collisions with power lines, and loss of habitat due to human encroachment. There were 39 known nesting pairs of peregrine falcons in California in 1980, up from 31 nesting pairs in 1979. The increased numbers of known breeding pairs are due to increased observation efforts and a probable limited increase in the population. It is estimated that 50 to 60 pairs of peregrine falcons presently occur in California.

Several historic eyries are located along the coast from Point Conception south to the Mexican border. At present, however, there are no known active sites south of the eyrie at Morro Bay. Considerable effort is currently being expended toward recovery of this species, chiefly through captive propagation and reintroduction. The Channel Islands include several sites where reintroduction efforts may eventually be made. Natural expansion of American peregrines is anticipated with the decreased usage of residual pesticides.

Three potential sources of impact to peregrine falcons may occur from OCS leasing and exploration activities in southern California: disturbance to eyrie sites resulting from development of onshore facilities and increased human activity, the possibility of an oilspill reaching the coast and contaminating its food sources, and the possibility of a falcon coming in contact with oil and contaminating its eggs. The diet of peregrine falcons is almost exclusively birds, and like most raptors, the peregrine is an opportunistic feeder. Birds such as ducks and shorebirds which become contaminated as a result of an oilspill would be compromised in their ability to fly and to avoid capture. Oiled birds would be easy prey for the peregrine falcon, which might suffer potentially lethal effects from consuming petrochemically contaminated prey.

Dr. F. Prescott Ward, Ecology Branch, Department of the Army, captured and released an oiled peregrine in the course of his peregrine falcon migration study at Chincoteague National Wildlife Refuge (NWR) in Virginia. The bird was subsequently encountered a total of 36 times by Dr. Ward, during which time the effects of oiling on the peregrine were documented. Generally, feather wear was quite dramatic, as feathers became matted and eventually were worn or broken. This condition likely compromises the flight and predatory capabilities of the peregrine, thereby reducing the likelihood of survival.

Presently, the threats to peregrine falcons from oil and gas activities in the SCB are minimal. As true migration probably does not occur with the American peregrine falcon in southern California, and the Arctic peregrine falcon (Falco peregrinus tundrius) is considered a rare migrant along the Pacific coast, there would not be a seasonally susceptible influx or concentration of peregrines in the SCB. In addition, the BLM and GS have determined that the probability of a spill occurring during exploration activities is minimal.

Therefore it is my biological opinion that the proposed leasing and exploration activities in southern California are not likely to jeopardize the continued existence of the American peregrine falcon, and as its Critical Habitat is not in the project area, it is not likely to result in the destruction or adverse modification of the Critical Habitat.

However, the Service would like to alert the BLM and the GS to the possibility of future releases of peregrine falcons in southern California, particularly in the Channel Islands area. The Draft Recovery Plan indicates an intent to establish a minimum of five pairs of peregrine falcons on the Islands, probably by hacking (a modified version of the falconer's technique for training raptors for release into the wild). Should this recovery effort be initiated, the BLM and GS would be required to reinitiate Section 7 consultation if it is determined that OCS activities may affect the peregrine falcon.

California Least Tern (Sterna albifrons browni)

The California least tern was listed as Endangered in the Federal Register on October 13, 1970. Critical Habitat has not yet been designated for this subspecies. The least tern migrates from Mexico each spring to establish breeding colonies on the California coast. From April to September it occupies coastal habitats between the Pacific coast of Baja California and the San Francisco Bay.

The least tern usually chooses a nesting location in an open expanse of sand, dirt, or dried mud close to a lagoon or estuary where food can be obtained. Prey consists of small fish such as the northern anchovy, deepbody anchovy, jacksmelt, topsmelt, California grunion, shiner surfperch, California killifish, and mosquitofish. The reduction in numbers of least terns has resulted from the loss of feeding and nesting habitats and disruption of nest sites by human-associated activities.

Potential threats to the California least tern from oil and gas activities are related to oilspills and increased human activities in coastal areas where nesting colonies occur. The birds could be contaminated by a spill as they dive for food. This may contribute to direct mortality or result in reduced hatchability of eggs oiled from the fouled plumage of an adult bird. Toxicology studies have indicated that even small amounts of oil applied to an egg are toxic to the embryo. Oilspills cause severe damage when they enter coastal wetlands, and could contaminate prey species and/or their habitat thus destroying essential feeding areas for the terns.

As onshore development is expected to be limited to existing facilities during the exploratory phase, no disturbance to least tern habitat is expected to occur as a result of leasing and exploration activities. In addition, the probability of a spill occurring during exploration activities is remote.

Therefore, it is my biological opinion that leasing and exploration activities are not likely to jeopardize the continued existence of the California least tern.

To assist GS in implementing its responsibility for the conservation of the species, the following recommendation is given: GS should require that all

Oilspill Contingency Plans include provisions for the deployment of adequate containment equipment into the areas listed as essential habitat in the California Least Tern Recovery Plan. The necessary equipment must be located so that it can be onsite and deployed within 2 hours to protect least tern areas that are threatened by a spill.

The areas identified in the California Least Tern Recovery Plan as essential habitat for least terns are: Mission Bay; Sweetwater Marsh Complex; Tijuana River Estuary; South San Diego Bay; North San Diego Bay; Los Penasquitos Lagoon; San Diequito Lagoon; San Elijo Lagoon; Batiquitos Lagoon; Aqua Hedionda Lagoon; Buena Vista Lagoon; Santa Margarita River; Santa Ana River; Anaheim Bay/Huntington Harbor; San Gabriel River/Alamitos Bay; Harbor Lake; Terminal Island; Playa del Rey; Mugu Lagoon; and Ormond Beach. Maps of these areas were included in the November 1, 1970, biological opinion to GS.

Palos Verdes Blue Butterfly (Glaucopsyche lygdamus palosverdesensis)

The Palos Verdes blue butterfly was listed as Endangered in the Federal Register on July 2, 1980. The three localities on the Palos Verdes Peninsula (Los Angeles County) where the only known populations occur are designated as Critical Habitat.

This butterfly was once known from four restricted localities on the Palos Verdes Peninsula. The Palos Verdes blue butterfly has been extirpated from one area due to housing development, and two other localities have been adversely affected by weed control practices that threaten the coastal chapparal colonies of Astragalus trichopodus leucopsis (the butterfly's only host plant). The rototilling of weeds for fire prevention and other similar land management practices, in addition to housing development and increased recreational use (especially at one locality that has been designated a city park) threaten the continued existence of the Palos Verdes blue butterfly.

As onshore development during the exploration phase is expected to be limited to existing facilities, no disturbance to the Palos Verdes blue butterfly's Critical Habitat is expected to occur as a result of leasing and exploration activities.

Therefore, it is my biological opinion that the leasing and exploration activities are not likely to jeopardize the continued existence of the Palos Verdes blue butterfly or result in the destruction or adverse modification of its Critical Habitat. However, any activity authorized, funded, or carried out by a Federal agency, particularly activities associated with OCS development and production, will require Section 7 consultation if the Palos Verdes blue butterfly and/or its Critical Habitat may be affected.

Light-footed Clapper Rail (Rallus longirostris levipes)

The light-footed clapper rail was listed as Endangered in the Federal Register on October 13, 1970. Critical Habitat has not yet been designated for this subspecies. Historically, the clapper rail's range extended from Santa Barbara County, California, to San Quintin Bay, Baja California, Mexico. Currently, this subspecies probably occurs in 16 California marshes (from Goleta Slough in Santa Barbara County south to the Tijuana Estuary in San Diego County) and at least two marshes in Baja California. The distribution is markedly interrupted because of discontinuous habitat. Over harvesting may have occurred in some areas of the clapper rail's range, but reductions in populations can be attributed almost entirely to loss of habitat. It has been estimated that over 65 percent of its former habitat has been lost through reclamation of marshes, water diversion, restriction of tidal flow, and degradation by water pollution.

The light-footed clapper rail is found in saltwater marshes traversed by tidal sloughs, where cordgrass (Spartina foliosa) and pickleweed (Salicornia) are the conspicuous plants. Food consists of various invertebrates (crustaceans, mollusks and annelids) found in tidal coastal marshes.

Estimates now indicate a total population of about 250 birds on the basis of work in Santa Barbara and Ventura Counties at Anaheim Bay and at Tijuana Estuary. Through the efforts of the Light-footed Clapper Rail Recovery Team, a plan to stabilize this species through land acquisition and marsh management has been approved.

Potential threats from oil and gas activities could be from oilspills and increased human activities in the estuaries where existing rail populations occur. However, BLM and GS have determined that the possibility of an oilspill during leasing and exploration activities is remote, and it is expected that existing onshore facilities will be utilized during these phases of OCS activities.

Therefore, it is my biological opinion that the leasing and exploration activities are not likely to jeopardize the continued existence of the light-footed clapper rail.

To assist GS in implementing its responsibility for the conservation of the species, the following recommendation is given: GS should require that all Oilspill Contingency Plans include provisions for the deployment of adequate containment equipment into the areas listed as essential clapper rail habitat. The necessary equipment must be located so that it can be onsite and deployed within 2 hours to protect clapper rail areas that are threatened by a spill. Those areas considered to be essential to clapper rails are: Mission Bay; Sweetwater River complex; Tijuana River Estuary; South San Diego Bay; San Diego River mouth; Los Penasquitos Lagoon; Upper Newport Bay; Anaheim Bay; Mugu Lagoon area; Carpinteria Marsh; and Goleta Slough. Maps of these areas were included in the November 1, 1979, biological opinion to GS.

El Segundo Blue Butterfly (Euphilotes [=Shijimiaeoides] battoides allyni)

The El Segundo blue butterfly is an insect endemic to the southern California coastal strand. This species was listed as Endangered in the Federal Register on June 1, 1976. Critical Habitat has not yet been designated for this species. This butterfly is limited to two small remnants of the once extensive El Segundo Dunes system (36 square miles) extending from the Los Angeles Airport to San Pedro, in Los Angeles County. Its current distribution is limited to dunes adjacent to the Los Angeles Airport and a small parcel of commercially owned land on the Chevron oil refinery in El Segundo.

The El Segundo blue is dependent upon coastal dune habitat which contains two species of buckwheat (Eriogonum ssp.) that provide the butterfly with nesting, feeding, and resting habitat. The conversion of this essential dune habitat to urban development threatens the continued survival of this species.

Onshore activities such as the expansion of refineries and the placement of pipelines present the greatest threat to the destruction of this species' habitat. Possible development scenarios for OCS Sale No. 68 identify a proposed offshore pipeline route for the Anacapa-Santa Monica Basin, with a temporary operational support base near El Segundo. There could be approximately 3 kilometers (2 miles) of buried onshore pipeline at El Segundo. Once the precise location of the above structures has been determined in future development plans, it will be necessary to reinitiate Section 7 consultation if a "may affect" determination is made.

However, since existing onshore facilities are to be used during OCS leasing and exploration, it is my biological that these phases of oil and gas activities are not likely to jeopardize the continued existence of this species.

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle was initially considered to have two distinct subspecies. The southern bald eagle was listed in the Federal Register as Endangered on March 11, 1967. The entire species was listed as Endangered in 43 of the conterminous 48 States (including California) and Threatened in the remaining five States on February 14, 1978. Critical Habitat has not been determined.

This large bird occurs from Alaska to northern Mexico, and lives in association with aquatic habitats such as lakes, large rivers, and estuaries. Historically the Channel Islands had a minimum of 24 nesting pairs of bald eagles. The birds were known to have nested on the Islands until the mid 1950's. The extirpation of nesting bald eagles on the Channel Islands was attributable to a number of causes. Tourists and sheepherders annually killed eagles. Egg collecting, and increased use of the Islands by tourists and residents, and sonic booms from military jet aircraft all contributed to the decline.

The possible role of DDT in the decline of the bald eagle on the Channel Islands is unclear. DDT was introduced into the southern California marine ecosystem in the late 1940's. It is generally accepted that DDE (a DDT metabolite) was the agent involved in the egg shell thinning and subsequent decline of the populations of brown pelicans and double-crested cormorants occupying the Channel Islands. It is possible that the reproduction of the remnant bald eagle population on the larger islands was impacted, thus dealing the final blow to the Channel Islands population.

In 1980, the Institute for Wildlife Studies (IWS), Arcata, California, released (translocated) six immature bald eagles from Washington State on Santa Catalina Island in an attempt to reestablish eagles on the Channel Islands. It is believed that five of the six birds have adapted to Santa Catalina, and the IWS has plans for the release of an additional six eagles in 1981 (and in subsequent years), pending receipt of the appropriate Federal Fish and Wildlife Permit. Ron Jurek, the Pacific Bald Eagle Recovery Team Leader, has identified the Channel Islands as the highest priority area for reestablishing bald eagles in California through translocation efforts.

The potential impacts to the eagle from oil and gas activities are disturbances to its nesting areas resulting from onshore activities, and the possibility of an oilspill reaching the coast and subsequently oiling the eagles and/or contaminating their food source. Oiled eagles returning to the nest could contaminate the eggs or nestlings. Toxicological studies have indicated that even small amounts of oil applied to an egg are toxic to the embryo.

No onshore oil and gas development is proposed for the Islands. Currently there are no eagles nesting on the Islands, although that is an objective of the translocation project. Further, it has been the observation of the IWS that eagles released on Santa Catalina Island are foraging heavily on feral pigs and goats (including carrion). This pattern of feeding behavior reduces the likelihood of negative impacts from oilspills, specifically the ingestion of petrochemically contaminated fish.

Therefore, it is my biological opinion that OCS leasing and exploration in the area is not likely to jeopardize the continued existence of the bald eagle in southern California. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly activities associated with development and production, will require Section 7 consultation if the bald eagle may be affected. Should significant new information relative to the bald eagle become available, you must reinitiate Section 7 consultation.

Salt Marsh Bird's Beak (Cordylanthus maritimus ssp. maritimus)

Salt marsh bird's beak is an annual herb (15-30 cm high) with purple flowers, that inhabits the upper elevations of tidal salt marshes. Populations of bird's beak are associated with pickleweed (Salicornia) and salt grass (Distichlis) near elevations at and above high tide. The bird's beak was listed in the Federal Register as Endangered on September 28, 1978. Critical Habitat has not yet been determined.

Historically, this subspecies occurred from Carpinteria in Santa Barbara County south to San Diego County and Northern Baja California, Mexico. Today, distribution is restricted to the Sandyland Marsh (Carpinteria) in Santa Barbara County, Point Mugu in Ventura County, and the Tijuana River Estuary in San Diego County. Destruction of coastal salt marshes is the major factor responsible for the elimination of this wetland species.

The Carpinteria Marsh area and the Tijuana River Estuary are in public ownership; and since existing onshore facilities will be utilized, the potential for further destruction of the existing habitat of the bird's beak from OCS activities has been reduced. The probability of an oilspill reaching this species' habitat is minimal.

Therefore, it is my biological opinion that OCS leasing and exploration in the southern California area is not likely to jeopardize the continued existence of the salt marsh bird's beak.

To assist GS in implementing its responsibility for the conservation of the species, the following recommendation is given: GS should require that all Oilspill Contingency Plans include provisions for the deployment of adequate containment equipment into the Sandyland Marsh (Carpinteria), Point Mugu, and Tijuana River Estuary. The necessary equipment must be located so that it can be onsite and deployed within 2 hours to protect bird's beak habitat threatened by a spill.

Any activity or program authorized, funded, or carried out by a Federal agency, particularly activities associated with development and production, will require Section 7 consultation if the salt marsh bird's beak may be affected.

Southern Sea Otter (Enhydra lutris nereis)

The population of sea otters in California was listed as Threatened in the Federal Register on January 14, 1977 (42 FR 2968). Critical Habitat has not been determined for this species. The listing notice stated that "A major spill of oil from a tanker in the waters in the vicinity of the range of the southern sea otter is probably the most serious potential threat to these animals; and indeed, they are more susceptible to this problem than most species."

The historic range of sea otters extended from Morro Hermoso, Baja California, northward along the coast, becoming continuous with the populations now found along the Alaska Peninsula and westward. Historic abundance of otters in California was estimated at about 16,000 animals.

Sea otters were heavily exploited for their pelts by Russian and American fur traders from 1786 through the early 1900's. The California population of the sea otter was so depleted that it was thought to be extinct by the turn of the century. The "rediscovery" of the southern sea otter by the scientific community occurred in 1938 when a group of approximately 50 otters were observed near Bixby Creek, just north of Point Sur (Figure 1). The International Fur Seal Treaty of 1911 and California State laws enacted since 1913 established legal protection for the species by prohibiting the taking and possessing of sea otters. In 1941 the California Sea Otter Refuge was established to further protect the otter from being shot. The Marine Mammal Protection Act of 1972 and the Endangered Species Act (ESA) of 1973 have increased the legal protection of the California sea otter population.

The range expansion of the southern sea otter population from its nadir in 1914 to its occupied range in 1979 averages 1.80 miles per year southward and 1.06 miles per year northward. In the last 5 years, however, the southward expansion of range has averaged 4 miles per year. The current range extends along approximately 200 miles of coast between Soquel Point in Santa Cruz County, south to Oceano, San Luis Obispo County. A few wandering individuals have been sighted to the north and south of these range limits. Provided the population continues to increase, the population should eventually extend its range south to the Channel Islands and north beyond Point Ano Nuevo. At the current rate of expansion it is possible that the otter's range could reach Point Conception, the northern limit of Sale No. 68, in the next 12 to 14 years (1993-1995). This natural rate of expansion, would extend the range of the sea otter to include the Channel Islands Marine Sanctuary, by 1995. This timeframe is well within the production life of Sale No. 68, estimated to be from 1987 through 2006, and will be within the timeframe of future sales in this same area.

The California Department of Fish and Game (CDFG) has attempted to monitor sea otter population growth (Figure 2, Table 1 attached). Based on estimates of population size between 1940 and 1969, the average annual rate of increase was 5.4 percent. This rate of increase is comparable to that seen in Alaskan populations. A CDFG census in 1976 estimated the population to be approximately 1,760 animals. A similar census in 1979, estimated the population at 1443 individuals. Although this census was impaired by poor weather conditions, the best available data does not indicate a change in the population size. FWS biologists believe that the approximate size of the present population has not changed substantially since 1976, and probably numbers about 1800 animals. In comparison with open-ended populations in Alaska, the California population is growing at a rate slower than one would expect. There are three general explanations for this: (1) age-specific fecundity is different; (2) age-specific survival is different (including human-caused mortality); and (3) animals are being lost through emigration. It is not known which of the three theories, or which combination of them, is responsible for the slow rate of population growth.

The southern sea otter exhibits a dumbbell shaped distribution pattern along the California coast. The largest concentrations are located at the periphery of the range. These groups (fronts) are predominently composed of both breeding and non-breeding males. The size of frontal groups varies seasonally. Peak numbers occur in late winter and early spring. Breeding females, juvenile females, and dependent pups are principally distributed throughout the center of the range. Kelp beds die back in the winter and storms further reduce the remaining beds. Consequently, the concentrations of otters rafting in the remaining kelp beds become larger, and the distribution of otters tends to become more clumped during the winter.

Insulation from cold seawater is provided entirely by air trapped in the dense sea otter fur. They maintain a high metabolic rate which partially compensates for the lack of an insulation layer of subcutaneous fat. Otters consume about 25 to 35 percent of their body weight per day, and foraging occurs intermittently throughout each day. Sea otters consume a variety of invertebrate species. Sea urchins, abalone, rock crabs, and pismo clams appear to be selectively preyed upon whenever they are available. As areas are occupied for longer periods by sea otters, the availability of large invertebrates decreases and smaller species such as turban snails, kelp crabs, mussels, and octopuses are more readily consumed. Sea otters show a great capacity for adapting to the availability of prey in different habitats. A major factor limiting the sea otter's range of foraging is the availability of food. Southern sea otters rarely dive beyond 20 fathoms when foraging since most food species become more scarce at greater depths. The greatest abundance and diversity of food items occur in areas with rocky bottoms. This may account for the relatively slow rate of expansion that occurs in these areas. Conversely, the fastest rates of expansion tend to occur over areas with sandy bottoms.

Southern sea otters rarely emerge from the sea. When resting at sea, they often wrap themselves in kelp to remain stationary. In winter when kelp beds are reduced, they may raft some distance offshore without the benefit of kelp while waiting out a storm, but usually they seek the protection of sheltered coves. Sea otters are non-migratory, although seasonal movements of individuals within the constant range do occur.

An oilspill on the OCS could impact sea otters in several ways. The way in which sea otters are affected by oil is influenced by the type of oil spilled, weather conditions, physical geography of the area, type of local marine flora and fauna, previous exposure of the area to oil, exposure of the area to other pollutants, and treatment of the spill.

Direct contact with oil would mat the fur and decrease the otter's natural insulation against temperature loss, resulting in hypothermia and probable death of individuals. The effects of oiling sea otters was studied by Kooyman and Costa (1979). Their studies indicated that under certain conditions sea otters can sustain low levels of oil contamination when 20 percent or less of the body surface is oiled. Kooyman and Costa concluded that contamination of 30 percent or more of the body surface will probably result in death. These conclusions appear to be supported by the findings of other research specialists. Presently available data do not conclusively demonstrate the effects of low level oil contamination on sea otters.

The ability of sea otters to detect oil in their environment is unknown. It has been reported that otters may react to the repugnant odors of petroleum products and move to avoid them. However, over 100 sea otters died as a result of pollution around Paramushin Island when gasoline and diesel fuel spilled from a tanker that went aground at Vasil' Yeu Cape. Investigations have shown that sea otters in captivity will not avoid oil contaminated areas and even repeatedly enter such areas after initial exposure.

Constant grooming to maintain the insulating quality of their coat would result in the direct ingestion of some petroleum products. Ingestion of petroleum products may also occur while eating contaminated invertebrates. Geraci and St. Aubin (1979) report that ingested oil is potentially toxic to sea otters. Although long-term effects of ingestion are unknown, certain petroleum hydrocarbons are potent carcinogens.

The present range of the southern sea otter population is in close proximity to onshore human communities where offshore oil development and increased transportation is either underway or planned. With the increase in offshore oil development and tanker traffic, there exists an increasing possibility of oil contamination within the otter's range. However, the sea otter does not presently inhabit the area considered in this consultation. The prevailing wind and ocean current patterns offshore southern California indicate a remote possibility that hydrocarbons spilled in the SCB would travel north and impact any portion of the sea otter's present population. This suggests that oilspills from presently leased tracts in SCB and those proposed in Sale No. 68 are not likely to impact sea otters in their current range. Further, BLM and GS have determined that oilspills during OCS exploratory activities are a remote possibility.

Therefore, it is my biological opinion that the leasing and exploration activities are not likely to jeopardize the continued existence of the southern sea otter. Any activity or program authorized, funded, or carried out by a Federal agency, particularly those related to proposed onshore facilities and development/production related activities, will require Section 7 consultation if sea otters may be affected. When the sea otter migrates into this area, you must reinitiate Section 7 consultation.

Brown Pelican (Pelecanus occidentalis)

The California brown pelican was originally listed as Endangered on October 13, 1970 (35 FR 8320). To date no Critical Habitat has been designated for this species. The only regular breeding colonies of this subspecies on the U.S. Pacific coast are located on Anacapa Island and nearby Scorpion Rock. During the 1980 breeding season, pelicans nested and successfully fledged young at Santa Barbara Island for the first time since 1967. The breeding population is augmented from late July through early November by large numbers of pelicans which regularly disperse north from Mexican waters. These migrants are generally gone by early December. However, it has been recently determined that some pelicans from Mexico are regularly recruited into the Anacapa breeding population. Pelicans are rarely found far from salt water, or farther than 20-30 miles offshore. Their major food is small fishes, primarily northern anchovy (Engraulis mordax) which the pelicans capture near the surface by plunge-diving from the air.

During the late 1960's and early 1970's the Anacapa colony suffered catastrophic nesting failure due to DDT and its derivatives accumulating in reproducing adults. A Los Angeles sewage system receiving liquid wastes from a DDT manufacturing plant was discharging effluent into the California coastal marine environment. Subsequent disposal of these wastes in a sanitary landfill resulted in a sharp decline of DDT input into the sea from this sewage system. Thereafter, levels of these compounds decreased in brown pelicans, and while the fledging rate has continued to fluctuate, it has not dropped to the low numbers experienced earlier.

There is a lack of specific information available relative to the effects which an oilspill might have on the population dynamics and reproductive success of pelicans. Contrary to statements made by Chevron U.S.A., Inc. before the

California Coastal Commission (1980), pelicans do not avoid oil. Pelican mortality due to oil fouling in the Gulf of California has occurred on at least two occasions. The only known incident of significant numbers of pelicans being oiled was after a spill from the Navy vessel Manatee in August, 1973. Concentrations of light tar washed up on beaches from San Clemente south into Mexico. Twenty to 25 juvenile pelicans were found oiled. In contrast, no pelicans were reported oiled as a result of the January 1969, Santa Barbara oilspill. Judging only from the location of the spills, the results should have been reversed, but timing was the determinent factor in these cases. The San Clemente spill occurred in the late summer when large numbers of pelicans were dispersed throughout the area. The Santa Barbara spill occurred in the winter, following a severe storm, when relatively few pelicans were in the area and fewer still would have been far from shelter. The San Clemente spill indicates that large amounts of oil anywhere within the pelicans' range could cause significant damage at the wrong time of year. In 1980, the pelican breeding season in southern California was 6.5 months long.

Pelicans may be affected by oilspills through contamination of their plumage since they dive for food or drift on the water surface. This may contribute to direct mortality or result in reduced hatchability of eggs oiled from the fouled plumage of an adult bird. As young pelicans fledge, they often congregate in large numbers on the water surface near the colony or on rocks along the shore. Young pelicans do not at first range far from the colony. If an oilspill occurred during the breeding season and impacted pelican nesting islands, the effects would be detrimental to the young pelicans and likely cause some mortality. In the fall and winter months when pelicans are not breeding, the thousands of Mexican pelicans which join the California coastal birds are vulnerable to oiling as they plunge-dive for food extensively throughout the waters of the SCB.

In southern California, the abundance of the anchovy resource varies almost unpredictably from year to year. "Brown pelicans depend on anchovies; their reproductive rates and survival vary with variations in the availability of anchovies" (Anderson et al. 1980). Unfortunately, there is little data currently available identifying the impacts (if any) which oilspills may have on the anchovy resource and its consequent availability to pelicans. However, three major areas of concern are recognized; 1) an oilslick may obscure the ability of foraging pelicans to visually locate anchovies, 2) petrochemically contaminated anchovies ingested by pelicans may cause lethal or sub-lethal effects, and 3) should a reduction in anchovy biomass occur as a result of an oilspill, this decrease in the prey base available to pelicans would reduce the potential for recovery of this listed species.

Adult pelicans incubating eggs or tending young commonly feed near the colony particularly in the Santa Barbara Channel just north of Anacapa Island. The pelicans depend on nearby food resources (30-50 km) during that period of time when they are incubating eggs or caring for young. Oilspills impacting the waters near Anacapa Island (or any breeding colonies) may reduce the availability of anchovies in critical foraging areas during the breeding season. Adult pelicans would find it necessary to forage greater distances from the colony, thus subjecting the eggs and/or young to increased periods of exposure to the elements and predation.

Since existing onshore oil and gas facilities would be utilized, and the possibility of an oilspill occurring from exploration activities is minimal, it is my biological opinion that the leasing and exploration activities are not likely to jeopardize the continued existence of the brown pelican. However, any activity or program authorized, funded, or carried out by a Federal agency, particularly those related to proposed onshore facilities, development/production related activities, and any OCS activities within the Channel Islands Marine Sanctuary, will require Section 7 consultation.

In accordance with OCS Operating Order No. 7, the proper authorities must be notified in the event of an oilspill occurrence. To insure maximum protection to pelicans, we recommend that following an oilspill GS require that oil containment equipment be deployed to bays and estuaries that might be impacted and that are inhabited by brown pelicans.

Cumulative Effects Resulting From OCS Activities

Cumulative effects are considered to be the direct and indirect effects of actions that are interrelated or interdependent with the action under consideration. Indirect effects of the action under consideration are those that are caused by the activity and are later in time or farther removed in distance, such as the progression from leasing OCS tracts, to exploration and ultimate development/production of the hydrocarbon resources. Other actions will be considered interrelated with the action if they are all part of a larger action, and other actions will be considered interdependent if they do not have significant independent utility apart from the action that is under consideration. The various lease sales, exploration, and development/production activities conducted and/or authorized by BLM and GS offshore southern California are considered part of the total OCS program for southern California. Further, companies involved in the OCS program utilize the same onshore support facilities, helicopter and/or fixed-wing aircraft facilities, docks, supply bases, pipelines, etc., for different OCS sale activities and activities from different sales.

There are currently 23 oil refineries operating in the southern California area that at full capacity are capable of processing 1,365,420 barrels of oil per day. This means that during the probable 25-year life of the Sale 68 fields, 12.5 billion barrels of oil must be provided to fully utilize the existing refineries. Whatever is not produced in the area will have to be imported, and transported oil has historically posed a much higher oilspill risk than drilling and producing locally. GS estimates that during the 25-year period, 7.373 billion barrels of oil will be imported through Los Angeles harbor. California onshore production will contribute 2.6 billion barrels. California State Tidelands will contribute 720 million barrels. Existing Federal OCS leases in southern California will contribute 788 million barrels and Sale 68 leases will contribute 123 million barrels (assuming that the total amount of projected oil is found and produced).

The probability of oilspill occurrence is predicated on the fundamental assumption that realistic estimates of future spill frequencies can be based on past OCS experience. The assumption is made that spills occur independently of each other and that the spill rate is dependent upon the volume of oil produced or transported. Figures 3, 4, and 5 (attached) show the known proposed and existing lease tracts for southern California OCS Sales, and the transportation routes for both OCS oil and imported oil. Table 2 (attached) shows the transportation scenarios for the proposed and existing lease tract group.

GS utilized the above information in combination with the data available in their accident files, production records, and information on tanker accident rates obtained from the published literature, to derive the overall spill predictions shown in Table 3 (attached). Transportation scenario 2 oilspill estimates are slightly higher than scenario 1 as a result of increased use of tankers to transport the oil under scenario 2.

This data supports the determination that there is an existing high probability of an oilspill impacting southern California resources due to the existing State and Federal leases and the high level of imported oil required to support existing refineries (See Figures 4-8 attached). The OSRA predicts that Lease Sale No. 68 could represent a 4 percent increase in spill potential; that is, increase the most likely number of spills from 22 to 23.

Clearly, the major threat to brown pelicans (and other listed species) from oilspills results from existing leases and tanker traffic, and not from Sale No. 68 alone. To further amplify this point, one need only examine the OSRA data for Anacapa Island, the major brown pelican breeding colony in the SCB. The probability of an oilspill (over 1,000 barrels) occurring and striking Anacapa Island within 30 days, is 8 percent when considering proposed tracts in Sale No. 68 only (transportation scenario 1). The probability increases to 78 percent under the same circumstances when existing and proposed leases and tanker traffic are considered. It should be noted that for both of these cases, the probabilities are slightly higher under transportation scenario 2. This demonstrates the futility of recommending specific tract deletions from Sale No. 68 to minimize or reduce oilspill threats to brown pelicans. This problem for pelicans is further complicated with the knowledge that large amounts of oil anywhere within the pelicans' range (which includes the SCB) could cause significant damage to the species if spilled at the wrong time of year (see brown pelican species account).

An ill-timed oilspill could significantly impact and/or reduce the brown pelican population in southern California. But the pelican population has demonstrated a remarkable resiliency over the past 12 years. The Anacapa Island breeding colony recovered from reproductive catastrophies of 4, 1, and 7 young produced from 1969 through 1971, to fledge 1438 young in 1980. While the total number of birds fledged is encouraging, the number of young fledged per nest in 1979 and 1980 was only .78 and .67 respectively. This is still far below the estimated productivity of 1.0 young fledged per nest which is indicative of a stable population. The large number of young fledged is probably a result of immigration of breeding adults from Mexican populations. Recruitment from Mexican pelican populations might mitigate or diminish the negative impacts which an oilspill off southern California might have on pelicans occurring in this area. However, the Service is concerned about the cumulative oilspill risks/impacts to brown pelicans and other listed species from existing and proposed oil and gas activities in southern California. While development scenarios remain speculative pending the results of exploration activities, it is apparent that GS's current cumulative estimate of 23 oilspills (of over 1,000 barrels), approximately one spill per year, in the Lease Sale No. 68 area over the life of the sale, is a threat to pelican populations which occur in the SCB. Whereas a subsequent biological opinion regarding the effects of OCS oil and gas development/production in southern California is dependent upon the results of exploration activities, present GS estimates of the hydrocarbon resource and production scenarios indicate that future development/production operations may be likely to jeopardize to the potential for recovery of the listed brown pelican.

No pelican losses from OCS activities off southern California or from nearby activities in the State tidelands have been reported to date, but development is just beginning in areas leased in previous OCS lease sales. Additional threats from OCS Sale No. 48 have been reduced by the withdrawal of tracts that were close to Anacapa Island. In addition to existing southern California OCS activities and proposed actions from Sale No. 68, two additional OCS Sales, Nos. 73 and 80, are scheduled for 1983 and 1984, respectively. The exact sale locations have yet to be determined, but should they occur in southern California, this would serve to further increase the cumulative impacts of OCS activities on listed species.

The Service would like to remind the BLM and GS of their continued obligation to conserve listed species throughout all phases of OCS activities. Although, for purposes of this consultation, only leasing and exploration actions relative to Sale No. 68 are considered, it is reasonable to conclude that leasing and exploration leads to the development and production of commercial deposits of hydrocarbons, and the inherent risks of oilspills. Therefore, we recommend that GS require the lessee to assign a high priority and prescribe specific measures for the protection of Anacapa Island, Scorpion Rock and Santa Barbara Island, in all Oilspill Contingency Plans submitted to GS for exploration (or development/production), and for activities that might result in substantially increased tanker traffic over the identified transportation routes. We further recommend that proposed pipeline segment T 17 be eliminated from all transportation scenarios. The OSRA estimates that oil spilled along this route has a 76 percent probability of striking Anacapa Island.

The FWS is encouraged to note that preferred transportation scenario 1 would utilize pipelines from platforms located in the Santa Barbara Channel and Santa Monica area to transport oil to shore. The inherent risks of transporting oil are reduced when using pipelines instead of tankers, thus the risks of oilspills to Anacapa Island are likewise reduced. The FWS urges BLM and GS to incorporate transportation scenario 1 into their future development/productions plans for Sale No. 68.

Currently, the range of the southern sea otter does not extend south of Oceano, San Luis Obispo County. This is approximately 50 miles north of Point Conception, Santa Barbara County, the northern limit for lease Sale No. 68. According to the information provided to the Service by BLM and GS, the sea otter (within its present range) will not be impacted by OCS activities in southern California. However, since 1977 the sea otter has expanded its range south by an average of 4 miles per year. Should this present rate of expansion continue, the sea otter would occur within the Lease Sale No. 68 area during the probable 25-year life of the Sale 68 fields. If the sea otter remains a listed species under the ESA, GS's present estimates of the hydrocarbon resource and production scenarios indicate that future development/production operations may be likely to jeopardize the continued existence of this listed species.

Advisory Statement

The FWS wishes to advise the BLM and GS of a number of activities presently taking place or proposed in the southern California area which may affect listed species. While the following projects/actions are not subject to this consultation, Federal agencies should take these activities into account during their planning process as they strive to accomplish their objectives and meet their obligations to conserve listed species.

1. The present controversy over the commercial fishery/brown pelican utilization of a common resource, the northern anchovy (Engraulis mordax), causes concern for the pelican's welfare. Brown pelicans depend on anchovies. Regurgitation studies at nesting colonies indicate that anchovies comprise 90-95 percent of the diet. Obviously, the management of these two species cannot be dealt with separately. Under the Fisheries Conservation and Management Act (FCMA) of 1976, responsible agencies are required to formulate management plans on all important commercial species of fish in order to insure optimum yield, with guaranteed perpetuation of that resource, and minimal impact to the rest of the system that contains that resource, i.e., to minimize the ecological effects of harvest. A major conflict is the multiple-use aspect of the resource: converting the anchovy resource to optimum yield to satisfy needs of all users (including wildlife).

The Anchovy Management Plan (1978) was one of the first management plans prepared under the FCMA. It was prepared by the Pacific Fisheries Management Council, a multi-agency group consisting of fishery biologists and fishery management specialists. In southern California the abundance of the anchovy resource varies almost unpredictably from year to year, but the plan attempts to provide a constant "forage reserve" for wild consumers of about 1 million tons (about one-fourth of maximum abundance) and only allows a proportion of the biomass over that forage reserve to be taken. The California Department of Fish and Game has developed computer capabilities for modeling anchovy populations given different harvest levels. However, one of the major weaknesses in the entire management and monitoring system seems to be the estimations of anchovy biomass and the need to incorporate much more data on the fish and wildlife consumers into the system.

The anchovy resource appears to be overfished, the three main indicators of this being population sex ratios, increasing mackerel population, and the Mexican harvest. Continued expansion of fishing fleets and pressure may eventually lead to overharvest of the Mexican segment of the anchovy population. This situation would likely prove detrimental to brown pelican populations south of the U.S./Mexico border. So far, negotiations for joint management of the northern anchovy fishery with Mexico have failed. Because of international uncertainties, it becomes most prudent that stewardship of U.S. pelican populations demonstrate foresight and maximum sensitivity.

The national and international commercial fishing pressures on the anchovy biomass, alone or in tandem with increasing oil and gas activities in the southern California area, may ultimately threaten the continued existence and recovery of the brown pelican.

2. The feasibility and practicality of translocating sea otters to formerly occupied habitat(s) within their historical range, for the purpose of establishing a second population is being examined and potential release sites are being reviewed. Every effort must be made to insure the protection and restoration of the sea otter population. This can be done most effectively by the combination of three means: a) by minimizing impacts associated with human activities especially those relating to oil, b) by protecting their natural habitat within all relevant portions of the otter's historical range, and c) by enhancing the populaton to a level such that the possibility that the otter will be decimated by a large-scale oilspill (its greatest threat) is eliminated.

At present the fastest and most direct method for insuring the continued existence of the California sea otter population is by eliminating the threat of decimation by a major oilspill. The most practical method to eliminate this threat and to restore the sea otter population to a non-threatened status in a timely fashion is by establishing a second population.

Early experimental translocations (1950's) of Alaskan sea otters failed. Failure of these operations was attributed primarily to insufficient knowledge of the role that sea otter pelage plays in thermoregulation. Duration and method of transport were the principal problems. During the period from 1965 to 1972, the Alaska Department of Fish and Game in cooperation with State, Federal, and Canadian provincial agencies translocated a total of 708 sea otters to unoccupied habitats in Alaska, British Columbia, Washington, and Oregon. The first apparently successful translocation of sea otters was initiated in 1965. In 1965 and 1966, 53 otters from the Alaskan population were released in Klag Bay, southeastern Alaska. Surveys conducted by the Alaska Fish and Game (in 1971) and the U.S. Fish and Wildlife Service (in 1975) indicate success in establishment of the translocated populations. The formula for a successful translocation and the reasons for failure are complex and not clearly understood. It is possible to reestablish sea otters in unoccupied habitat, but it appears to require a relatively large nucleus population. Those translocation attempts that were made closest to the captive location have been most successful. While the Service has not identified a specific translocation site, for the southern sea otter, Friends of the Sea Otter, a private special interest organization, has indicated an interest in San Nicolas Island in the Channel Islands. This area is currently being studied under a Service Cooperative Agreement with the Center for Coastal Marine Studies, University of California, Santa Cruz. The broad objectives of this program are: a) to further assess the suitability of San Nicolas Island as habitat for the sea otter, b) to describe the structure and organizations of littoral and sublittoral communities at San Nicolas with the thought that this information will serve as baseline data with which to compare changes following the introduction or natural reestablishment of sea otters, and c) through detailed observational and experimental study, elucidate over time, specific mechanisms responsible for maintaining community structure.

The Channel Islands area may be determined to be the most appropriate translocation site for the sea otters. In this event, commercial and private fishing interests, in conjunction with petroleum development industries, would likely oppose any effort by Federal, State, and private conservation organizations to translocate sea otters to the Channel Islands area. However, with the increase in offshore oil development and tanker traffic, there exists the increasing probability of oil contamination within the otter's present range. Increased threats from oil contamination amplify the urgent need to establish a second population, thus diminishing the potential catastrophic effects of a large-scale oilspill on California sea otters. The BLM and GS should be aware of the possibility of a translocation into the southern California area, and cognizant of their responsibility to reinitiate Section 7 consultation should it be determined that OCS activities may affect the southern sea otter. Should a second population of sea otters be established, BLM and GS would be required to insure that their actions do not jeopardize the continued existence and recovery of this population of southern sea otters.

3. The Space Shuttle may generate over-pressures (sonic booms) detrimental to marine species in general and listed species in particular. There are particular environmental concerns for disturbances to nesting birds (unnatural flushing from the nest may cause egg breakage or subject nest contents to predation), habitat damage from sonic boom induced landslides, and actual physical damage to the inner ears of birds and mammals. The long-term nature of the Space Shuttle Program (through at least 1991) means that wildlife conservation problems will need to be anticipated early, monitoring will need to be continued and measures taken to eliminate the impacts where necessary.

4. Future projects to prevent beach erosion, dredging projects, and port improvement or expansions will cause environmental concerns which may impact coastal listed species.

5. The possible sitings of liquified natural gas and refinery facilities may impact listed species. Impacts could result from the location of the facility and also from the transportation routes associated with the movement of the gas or oil from the offshore area to onshore facilities.

6. The incidence of chronic oil pollution in southern California may impact listed species. There are estimated to be as many as 2,000 to 2,665 natural oil seeps off the Santa Barbara coastline. These seeps may be releasing as much as 670 barrels of oil per day into the marine environment. Estimates are not firm because the rate of seepage is not constant. The impact from these natural spills, together with the expected number of spills from existing and proposed oil and gas activities in southern California, compound the oilspill risks to listed species. This cannot be quantified due to the variable nature of both the seeps and spills.

7. Should the aforementioned Notice of Deferral from NOAA regarding regulations which would prohibit hydrocarbon development within designated Marine Sanctuaries be permanently accepted, the Anacapa Island brown pelican nesting colony might be threatened by offshore hydrocarbon development in much closer proximity than initially believed.

8. The State of California leases tracts within three nautical miles of the coast. These activities generate the placement of pipelines, increased crew boats/supply boats and helicopters servicing the rigs, possible construction of additional processing facilities, and increased tankering which may affect listed species.

Conclusion

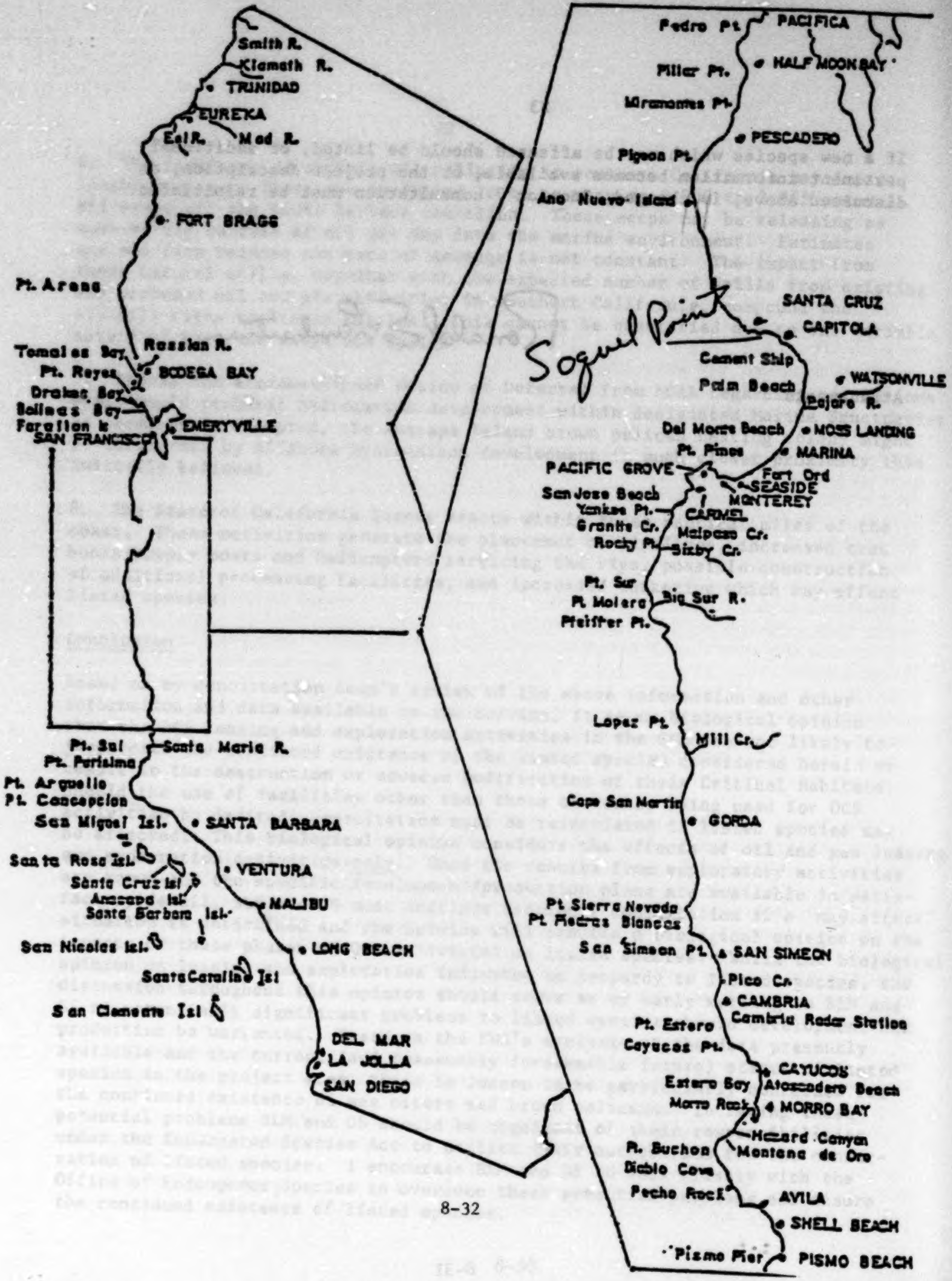
Based on my consultation team's review of the above information and other information and data available to the Service, it is my biological opinion that the OCS leasing and exploration activities in the SCB are not likely to jeopardize the continued existence of the listed species considered herein or result in the destruction or adverse modification of their Critical Habitats. Should the use of facilities other than those currently being used for OCS activities be desired, consultation must be reinitiated if listed species may be affected. This biological opinion considers the effects of oil and gas leasing and exploration activities only. Once the results from exploratory activities are known and the specific development/production plans are available in satisfactory detail, BLM and GS must initiate Section 7 consultation if a "may affect" situation is determined and the Service will provide a biological opinion on the impacts of these phases of OCS activities on listed species. While the biological opinion on leasing and exploration indicates no jeopardy to listed species, the discussion throughout this opinion should serve as an early warning to BLM and GS of potentially significant problems to listed species should development and production be warranted. Based on the FWS's analysis of the data presently available and the current (and reasonably foreseeable future) status of listed species in the project area, there is reason to be particularly concerned for the continued existence of sea otters and brown pelicans. In facing these potential problems BLM and GS should be cognizant of their responsibilities under the Endangered Species Act to utilize their authorities for the conservation of listed species. I encourage BLM and GS to work closely with the Office of Endangered Species to overcome these potential problems and insure the continued existence of listed species.

If a new species which may be affected should be listed, or additional pertinent information becomes available, or the project description, as discussed above, is changed, Section 7 consultation must be reinitiated.

Ronald E Lambertson

Attachments

Figure 1 - Map showing localities mentioned in text.


Smith R.
Klamath R.
TRINIDAD
EUREKA
Eel R.
Mad R.
FORT BRAGG
Pt. Arena
Tomales Bay
Russian R.
Pt. Reyes
BODEGA BAY
Drakes Bay
Bolinas Bay
Farallon Is
SAN FRANCISCO
EMERYVILLE
Pt. Sal
Santa Maria R.
Pt. Purisima
Pt. Arguello
Pt. Concepcion
San Miguel Isl.
SANTA BARBARA
Santa Rosa Isl.
VENTURA
Santa Cruz Isl
Anacapa Isl
Santa Barbara Isl.
MALIBU
San Nicolas Isl.
LONG BEACH
Santa Catalina Isl
San Clemente Isl
DEL MAR
LA JOLLA
SAN DIEGO
Pedro Pt.
PACIFICA
Pillar Pt.
HALF MOON BAY
Miramontes Pt.
PESCADERO
Pigeon Pt.
Ano Nuevo Island
SANTA CRUZ
CAPITOLA
Soquel Point
Cement Ship
Palm Beach
WATSONVILLE
Pajaro R.
Del Monte Beach
MOSS LANDING
Pt. Pinos
MARINA
PACIFIC GROVE
Fort Ord
SEASIDE
San Jose Beach
MONTEREY
Yankee Pt.
CARMEL
Granite Cr.
Malpaso Cr.
Rocky Pt.
Bixby Cr.
Pt. Sur
Pt. Molera
Big Sur R.
Pfeiffer Pt.
Lopez Pt.
Mill Cr.
Cape San Martin
GORDA
Pt Sierra Nevada
Pt. Piedras Blancas
San Simeon Pt.
SAN SIMEON
Pico Cr.
CAMBRIA
Cambria Radar Station
Pt. Estero
Cayucos Pt.
CAYUCOS
Estero Bay
Atascadero Beach
Morro Rock
MORRO BAY
Hazard Canyon
Pt. Buchon
Montana de Oro
Diablo Cove
Pecho Rock
AVILA
SHELL BEACH
Pismo Pier
PISMO BEACH

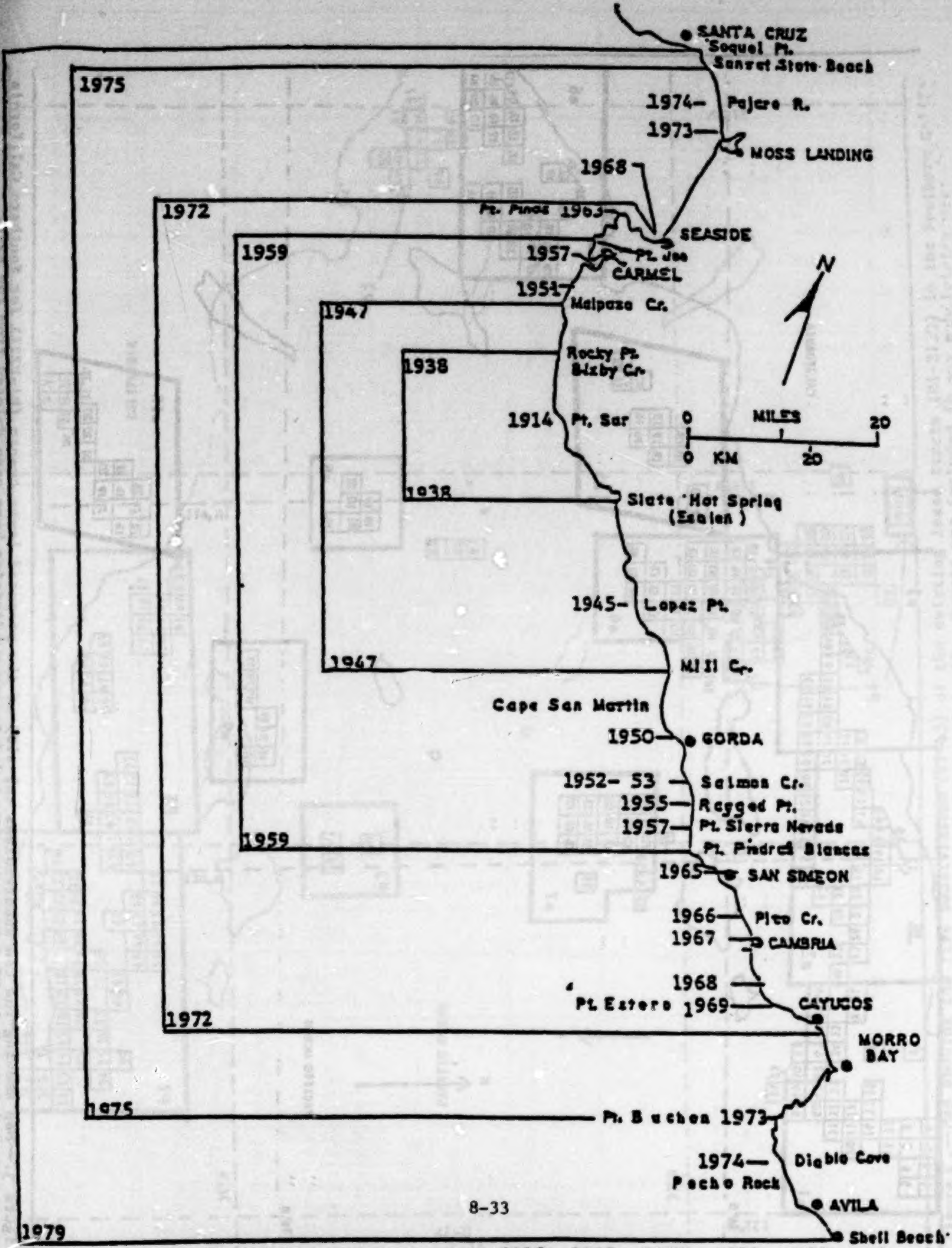

SANTA CRUZ
Soquel Pt.
Sunset State Beach
1975
1974
Pajaro R.
1973
MOSS LANDING
1968
1972
Pt. Pinos 1963
SEASIDE
1959
1957
Pt. Joe
CARMEL
1951
Malpaso Cr.
1947
Rocky Pt.
Bixby Cr.
1938
1914
Pt. Sur
N
0
MILES
20
0
KM
20
1938
Slate Hot Spring
(Esalen)
1945
Lopez Pt.
1947
Mill Cr.
Cape San Martin
1950
GORDA
1952- 53
Salmon Cr.
1955
Ragged Pt.
1957
Pt. Sierra Nevada
1959
Pt. Piedras Blancas
1965
SAN SIMEON
1966
Pico Cr.
1967
CAMBRIA
1968
Pt. Estero
1969
CAYUCOS
1972
MORRO BAY
1975
Pt. Buchon 1973
1974
Diablo Cove
Pecho Rock
AVILA
1979
Shell Beach

Figure 2 Established sea otter range in 1938, 1947, 1959, 1972, 1975, and 1979 and location of peripheral groups in other years. (Modified from CDFG. 1976)

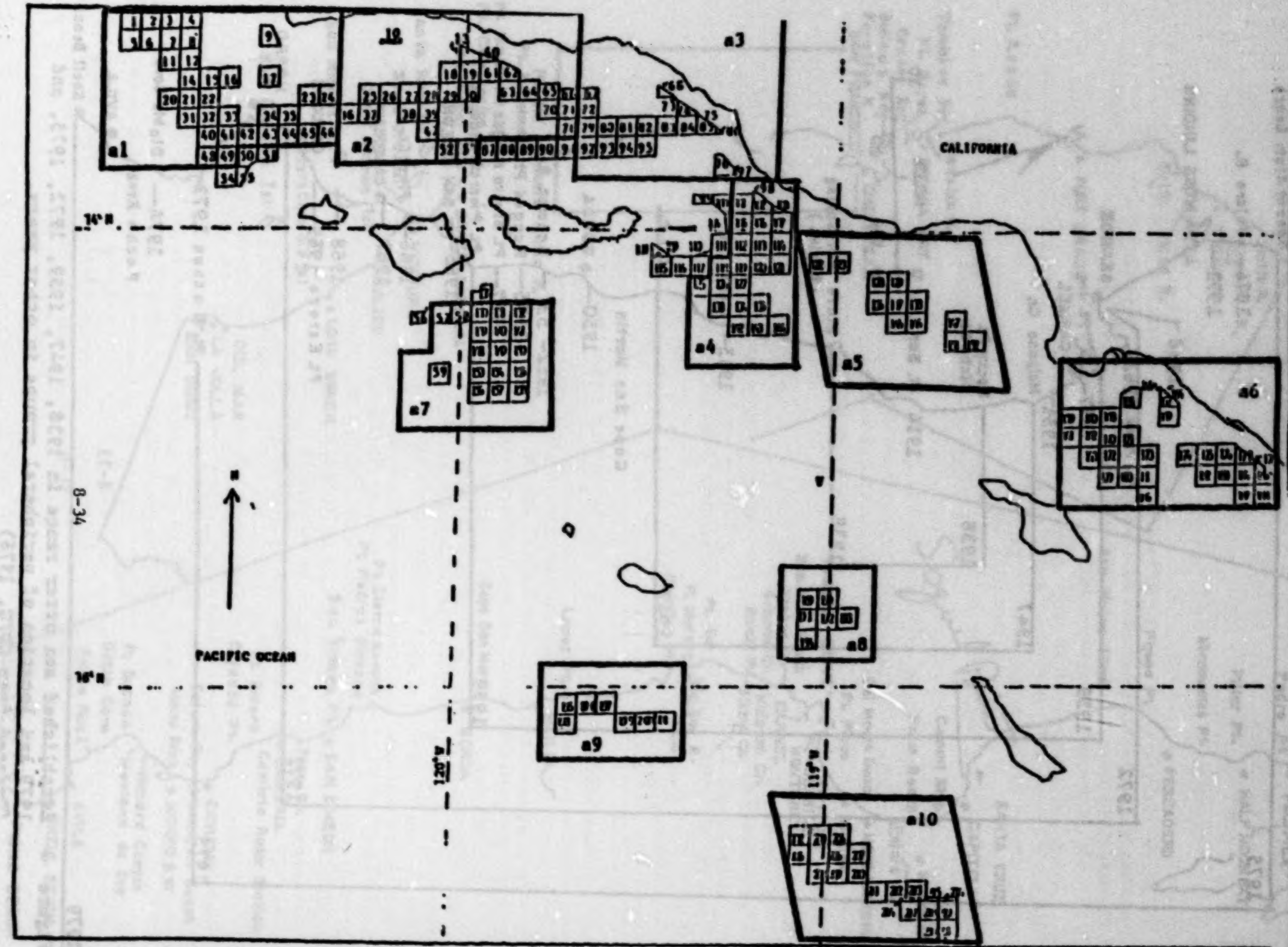

a1
a2
a3
a4
a5
a6
a7
a8
a9
a10
CALIFORNIA
PACIFIC OCEAN
34°N
33°N
120°W
119°W
N

Figure 3.--Map showing the ten subdivisions (a1-a10) of the proposed lease tracts (P1-P221) for Southern California OCS Lease Sale 68. Tracts not included in any subdivision have been deleted from the sale.

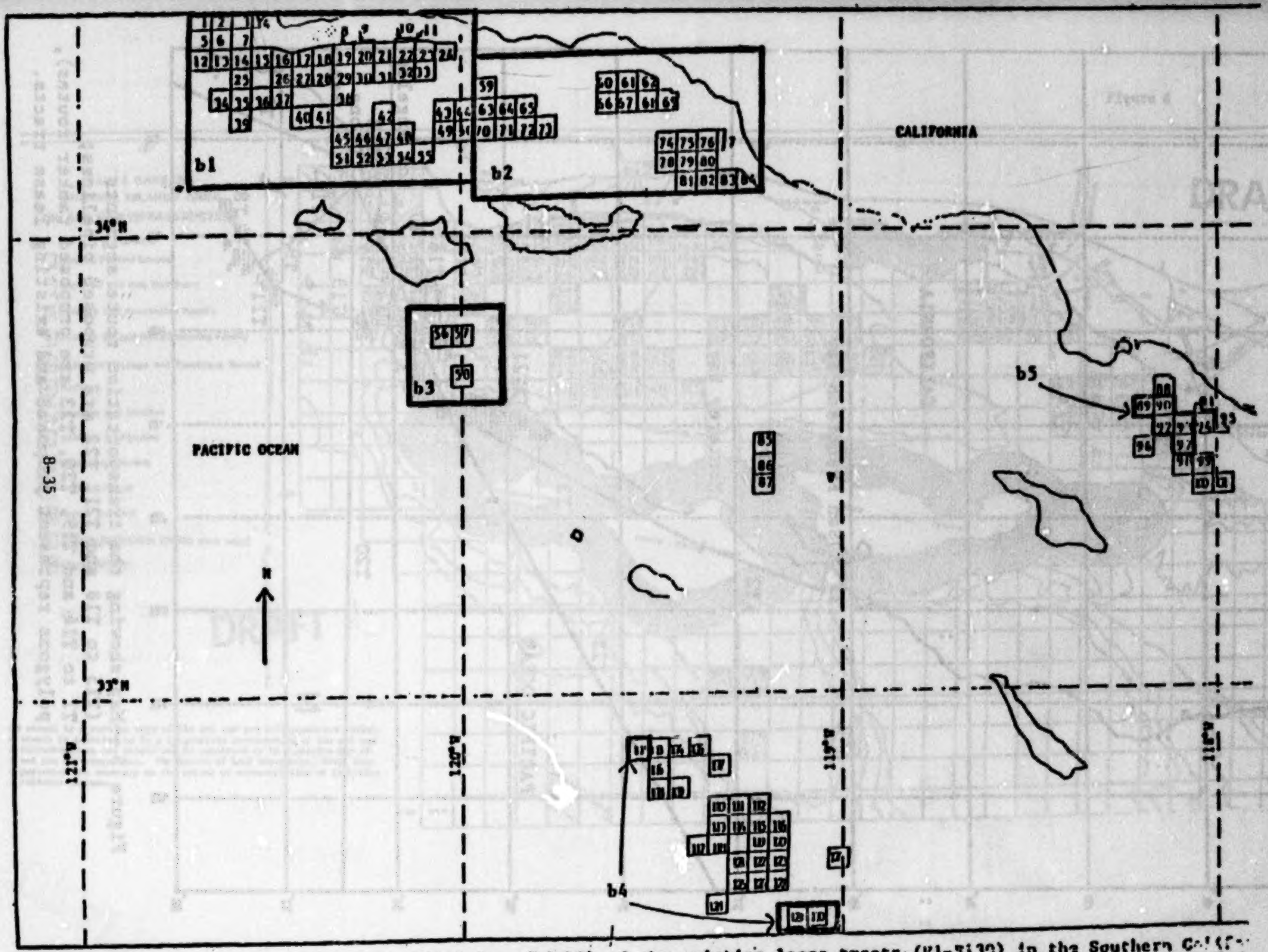

CALIFORNIA
PACIFIC OCEAN
N
34°N
33°N
121°W
120°W
119°W
118°W
b1
b2
b3
b4
b5

Figure 4.--Map showing the five subdivisions (b1-b5) of the existing lease tracts (1-133) in the Southern Calif... Bight for Southern California OCS Lease Sale 68. Tracts not included in any subdivision were ...

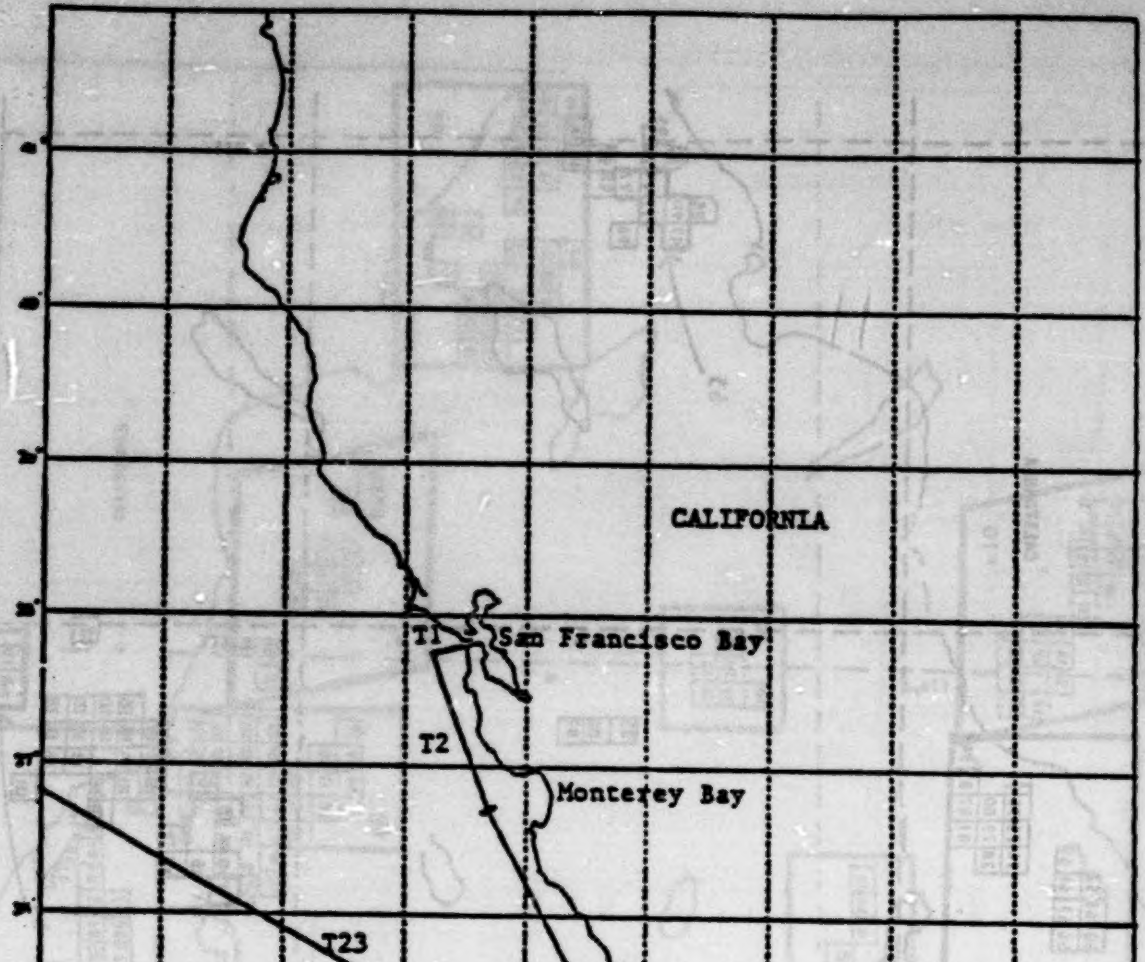
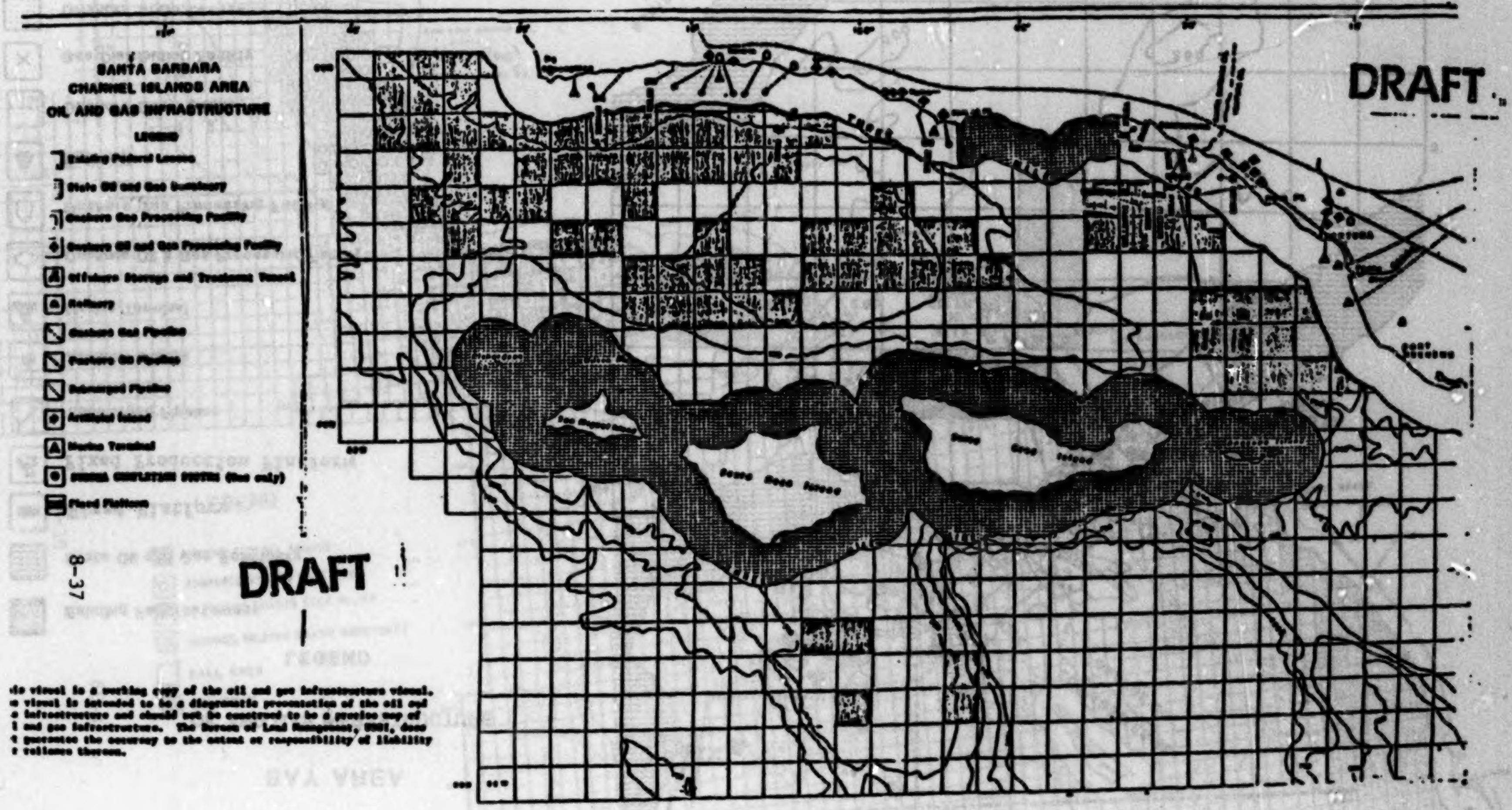

CALIFORNIA
T1
San Francisco Bay
T2
Monterey Bay
T23
T3
PACIFIC OCEAN
T21
T15
T16
T17
Los Angeles
T14
T22
T20
T19
T18
Long Beach
T13
N
T10
T12
T9
T11
T7
T8

Figure 5 —Map showing the transportation route segments (T15 to T18 and T21, T22 are proposed pipelines; T1 to T14 and T19, T20, T23 are proposed tanker routes), polygons represent proposed and existing lease tracts.

Figure 6


SANTA BARBARA
CHANNEL ISLANDS AREA
OIL AND GAS INFRASTRUCTURE
LEGEND
Existing Federal Leases
State Oil and Gas Boundary
Onshore Gas Processing Facility
Onshore Oil and Gas Processing Facility
Offshore Storage and Treatment Vessel
Refinery
Onshore Gas Pipeline
Onshore Oil Pipeline
Submerged Pipeline
Artificial Island
Marine Terminal
SUBSEA COMPLETION SYSTEM (Gas only)
Fixed Platform
San Miguel Island
Santa Rosa Island
Santa Cruz Island

DRAFT

DRAFT

is visual is a working copy of the oil and gas infrastructure visual.
e visual is intended to be a diagrammatic presentation of the oil and
s infrastructure and should not be construed to be a precise map of
l and gas infrastructure. The Bureau of Land Management, USDI, does
t guarantee the accuracy to the extent or responsibility of liability
r reliance thereon.

DRAFT

SAN PEDRO

BAY AREA

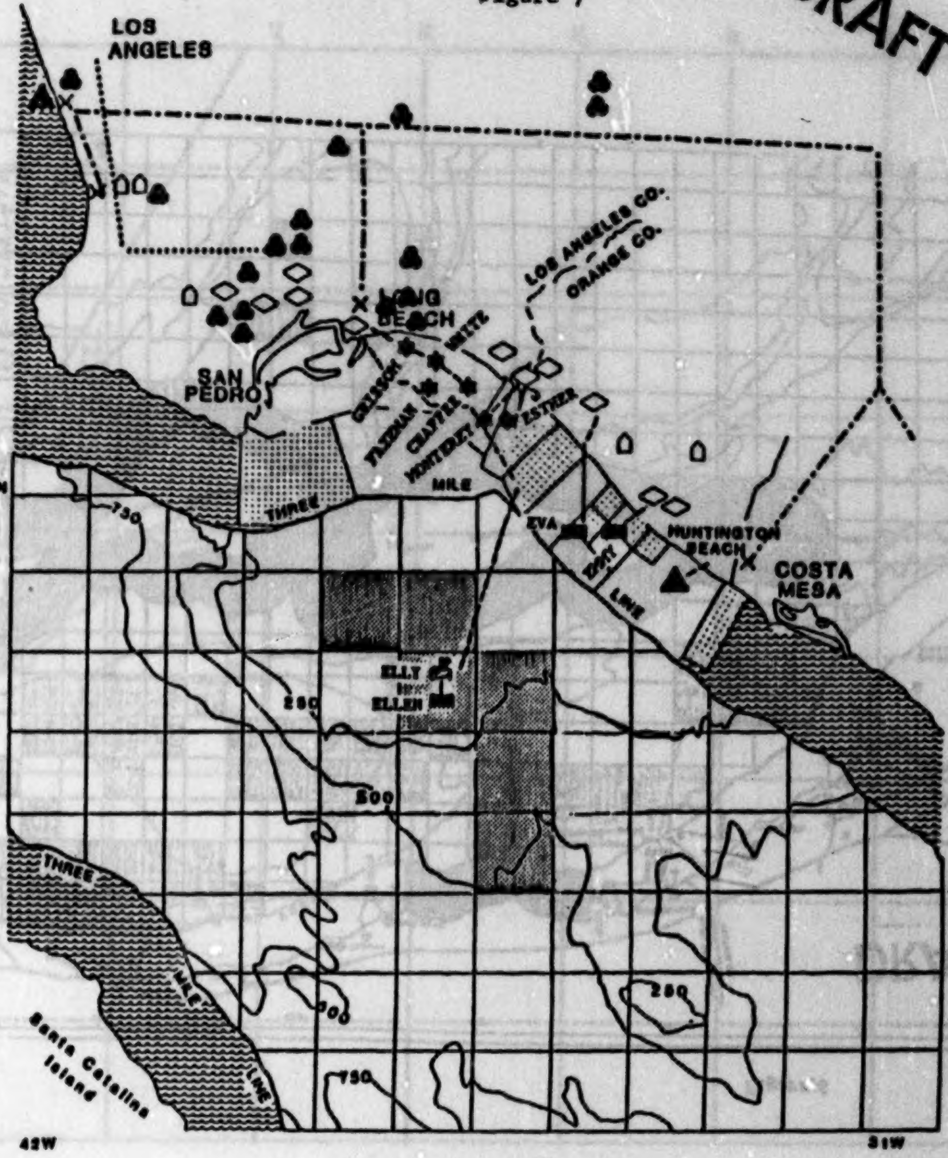
OIL AND GAS INFRASTRUCTURE

LEGEND

▩	Existing Federal Leases
≋	State Oil and Gas Sanctuary
▬	Fixed Platform
	Fixed Production Platform
⟋	Submerged Pipeline
✱	Artificial Islands
▲	Marine Terminal
◇	Onshore Oil & Gas Processing Facility
⌂	Onshore Gas Processing Facility
♣	Refinery
-·-	Onshore Gas Pipeline
×	Gas Distribution Facility
░	Offshore State Leases
····	Onshore Oil Pipeline

Figure 7

DRAFT


LOS ANGELES
LONG BEACH
LOS ANGELES CO.
ORANGE CO.
SAN PEDRO
GRISSOM
WHITE
FREEMAN
CHAFFEE
MONTEREY
ESTHER
EVA
EMMY
HUNTINGTON BEACH
COSTA MESA
THREE MILE LINE
ELLY
ELLEN
750
250
500
36N
31N
28N
42W
31W
2
THREE MILE LINE
Santa Catalina Island

This visual is a working copy of the oil and gas infrastructure visual. The visual is intended to be a diagrammatic presentation of the oil and gas infrastructure and should not be construed to be a precise map of oil and gas infrastructure. The Bureau of Land Management, USDI, does [illegible] responsibilities of liability

DRAFT

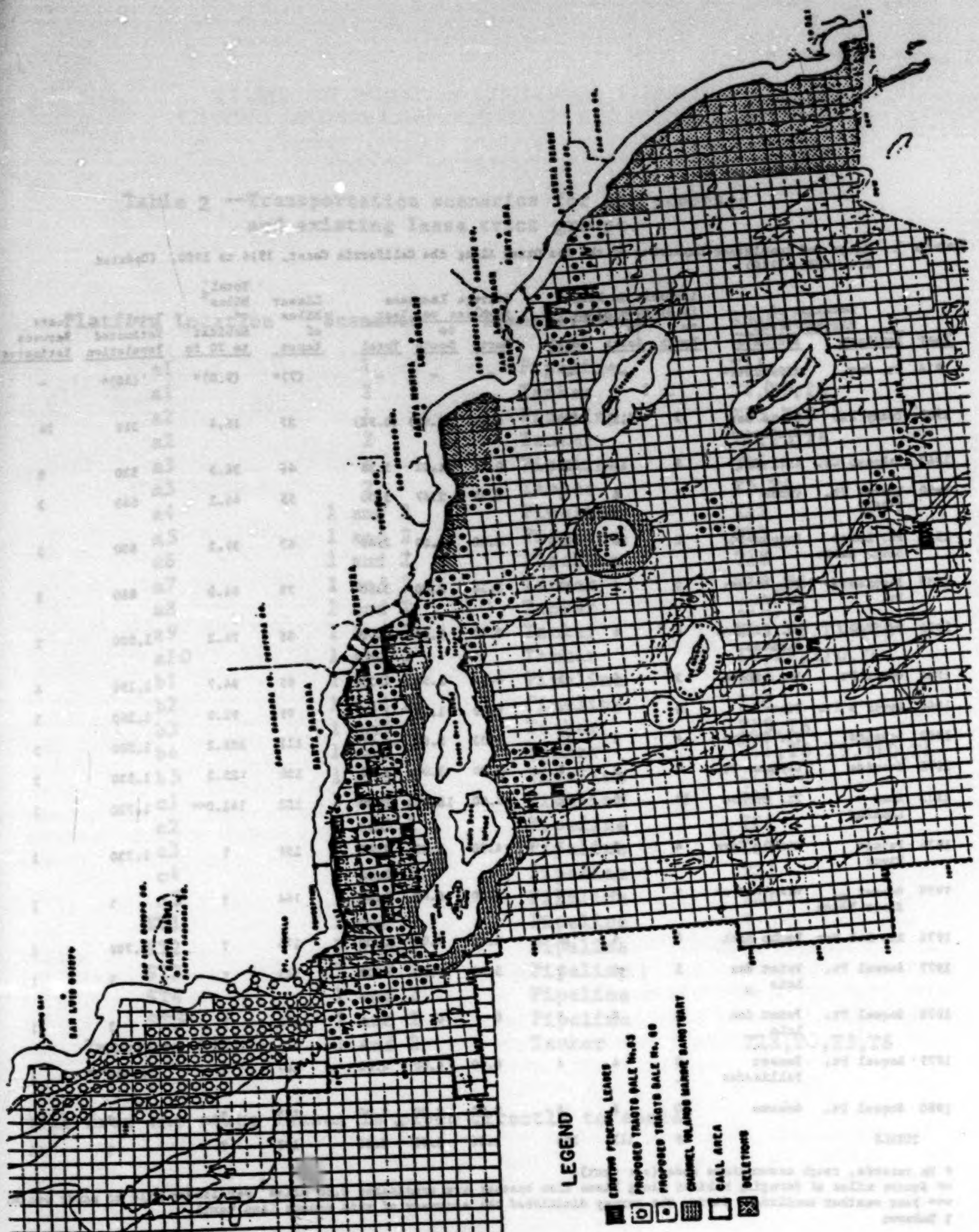

SAN LUIS OBISPO
SAN LUIS OBISPO CO.
SANTA MARIA
SANTA BARBARA CO.
PT. ARGUELLO
SANTA BARBARA
SANTA BARBARA CO.
VENTURA CO.
VENTURA
LEGEND
EXISTING FEDERAL LEASES
PROPOSED TRACTS SALE No. 35
PROPOSED TRACTS SALE No. 68
CHANNEL ISLANDS MARINE SANCTUARY
CALL AREA
DELETIONS

Table 1 Range and Population Expansion of the Sea Otter Along the California Coast, 1914 to 1980. (Updated from CDFG, 1976)

Year	Location of Migrant Front.		Increase in Range in Statute Miles			Average Increase in Miles per Year			Linear Miles of Range	Total Miles^2 of Habitat to 20 fm	Total Estimated Population	Years Between Estimates
	Northern	Southern	to North	to South	Total	to North	to South	Total				
1914	Pt. Sur	(Pfeiffer* Pt.)	-	-	-	-	-	-	(7)*	(9.0)*	(30)*	-
1923	Rocky Pt.	Slate Hot Springs	7	(13)	(20)	0.29	(0.63)	(0.92)	27	18.4	310	24
1947	Malpaso Cr.	Mill Cr.	5	14	19	0.56	1.02	1.58	46	36.5	530	9
1950	Yankee Pt. (1951)	Gorda	1	8	9	0.33	2.67	3.00	55	46.2	660	3
1955	Pt. Lobos South Shore	Ragged Pt.	2	10	12	0.40	2.00	2.40	67	59.2	800	5
1957	Pescadero Pt.	Pt. Sierra Nevada	7	4	11	3.50	2.00	5.50	78	66.0	880	2
1959	Pt. Joe.	Pt. Piedras Blancas	4	4	8	2.00	2.00	4.00	86	74.2	1,050	2
1963	Otter Pt.	San Simeon	3	6	9	0.75	1.50	2.25	95	84.7	1,190	4
1966	Lover's Pt.	Pico Cr.	0	4	4	0.00	1.33	1.33	99	92.0	1,260	3
1969	Seaside	Pt. Estero	4	8	12	1.33	2.67	4.00	111	105.2	1,390	3
1972	Seaside	Cayucos Pt.	0	9	9	0.00	3.00	3.00	120	125.2	1,530	3
1973	Moss Landing	Pt. Buchon	14	18	32	14.00	18.00	32.00	152	142.0**	1,720	1
1974	Pajaro River	Diablo Cove	4	3	7	4.00	3.00	7.00	159	?	1,730	1
1975	Sunset State Beach	Diablo Cove	5	0	5	5.00	0.00	5.00	164	?	?	1
1976	Rio Del Mar	Pecho Rock	6	4	10	6.00	4.00	10.00	174	?	1,789	1
1977	Soquel Pt.	Point San Luis	5	4	9	5.00	4.00	9.00	183	?	?	1
1978	Soquel Pt.	Point San Luis	0	0	0	0	0	0	183	?	?	1
1979	Soquel Pt.	Sunset Pallisades	0	4	4	0.00	4.00	4.00	187	?	1,443***	1
1980	Soquel Pt.	Oceano	0	8	8	0.00	8.00	8.00	195	?	?	1
TOTALS			69	117	186	1.06	1.08	2.86	193	?	?	66

* No records, rough assumptions made (see text).

** Square miles of foraging habitat along Pismo clam beaches are considered 0.50 miles^2 per linear mile of sandy beach.

*** Poor weather conditions during the survey diminished the accuracy of this census (see text).

? Unknown

Table 2 —Transportation scenarios for the proposed and existing lease tract groups.

Platform Location	Scenario	Transportation	Route(s)
a1	1	Pipeline	T15
a1	2	Tanker	T4,T5,T6
a2	1	Pipeline	T15,T16
a2	2	Tanker	T4,T5,T6
a3	1	Pipeline	T16
a3	2	Tanker	T5,T6
a4	1 and 2	Pipeline	T22
a5	1 and 2	Pipeline	T22
a6	1 and 2	Pipeline	T18
a7	1 and 2	Tanker	T19,T6
a8	1 and 2	Tanker	T10,T6
a9	1 and 2	Tanker	T11,T9,T10,T6
a10	1 and 2	Tanker	T8,T9,T10,T6
b1	1 and 2	Pipeline	T15
b2	1 and 2	Pipeline	T16
b3	1 and 2	Tanker	T19,T6
b4	1 and 2	Tanker	T11,T8,T9,T10,T6
b5	1 and 2	Pipeline	T18
c1	1 and 2	Pipeline	T21
c2	1 and 2	Pipeline	T21
c3	1 and 2	Pipeline	T21
c4	1 and 2	Pipeline	T21
c5	1 and 2	Pipeline	T21
ST1	1 and 2	Pipeline	*
ST2	1 and 2	Pipeline	*
ST3	1 and 2	Pipeline	*
ST4	1 and 2	Pipeline	*
ST5	1 and 2	Pipeline	*
Imported Oil	1 and 2	Tanker	T23,T4,T5,T6

*Oil from the state leases is piped directly to shore.

pages tightly bound

Table 3 -- Oilspill probability estimates for spills greater than 1,000 and 10,000 barrels resulting from OCS Lease Sale 68, from existing Federal leases, or from existing oil transportation in the Southern California area.

	Expected number of spills (mean).		Most likely number of spills (mode).		Probability of one or more spills	
	>1,000	>10,000	>1,000	>10,000	>1,000	>10,000
Sale 68 (scenario 1)	1.1	0.5	1	0	0.67	0.39
Sale 68 (scenario 2)	1.2	0.6	1	0	0.70	0.45
Sale 68 plus existing leases and imports (scenario 1)	23.2	11.8	23	11	0.99+	0.99+
Sale 68 plus existing leases and imports (scenario 2)	23.3	11.9	23	11	0.99+	0.99+
Existing leases plus imports	22.3	11.5	22	11	0.99+	0.99+

IN REPLY REFER TO:

United States Department of the Interior

1792 (542)

BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

JAN 13 1981

Memorandum

To: Director, Fish and Wildlife Service

From: Director, Bureau of Land Management

Subject: Joint Endangered Species Consultation for the Southern California Bight

In accordance with Section 7(c) of the Endangered Species Act, the Bureau of Land Management (BLM) and the U.S. Geological Survey (USGS) are requesting a joint regional consultation on the Outer Continental Shelf (OCS) oil and gas program in the southern California Bight. This regional consultation should consider all of the operations pertaining to oil and gas leasing and exploration in the area from offshore Point Conception south to offshore the U.S./Mexico border. In May 1978, the BLM requested a formal Section 7 consultation and received a biological opinion on a previous southern California Bight Lease Sale (Sale No. 48). Another oil and gas lease sale has been proposed for this same general region (Sale No. 68, June 1982) and we anticipate that additional sales will be proposed for this area at some time in the future. We believe that a joint regional consultation, that addresses impacts of the regional OCS oil and gas program on endangered and threatened species, will be a more efficient and economical approach than an agency-by-agency, sale-by-sale approach.

It is understood that by providing us with a regional biological opinion you will not be foreclosing on opportunities to reconsider that opinion in later phases of the program, or as future sales are proposed for this region. It is our position that additional sale proposals constitute new information and that formal consultation will be reinitiated at the appropriate time. Further, it is understood that formal consultation must be reinitiated before development and production activities begin in this region. These formal procedures will take place in addition to our ongoing informal consultations presently occurring through all phases and regions of the OCS leasing program.

We consider regional consultations far more valuable than sale specific ones. Regional biological opinions enhance our ability to assess the cumulative impacts of the OCS leasing program, identify regional data gaps and research needs, and provide us with an information base onto which our agencies can build in future consultations.

My staff has been in contact with your Office of Endangered Species regarding mutually agreeable arrangements for this consultation. Accordingly, it has been agreed that because of time, staff, and travel budget constraints, we will provide your agency with written and published material which will serve in lieu of a consultation meeting. Further, it has been agreed that receipt of this material will mark the commencement of the consultation period. The material provided includes a description of the OCS Sale No. 68 proposal, a species list, the results of the oil spill trajectory analysis conducted for Sale No. 68 and a copy of the Final Environmental Impact Statement prepared for OCS Lease No. 48. Our Washington and Pacific OCS Office staffs are prepared to provide your office with any additional material you may require, to meet with your staff as necessary, and to answer any questions your representatives may have.

If you have any questions concerning this request, please contact Ralph Ainger, Bureau of Land Management (542), Washington, D.C. 20240 (FTS) 343-6264, or Lynette Vesco, Pacific OCS Office, 1340 W. 6th Street, Los Angeles, California 90017 (FTS) 798-6745.

In order to permit maximum public review of this procedure and in accordance with the regulations for implementing the National Environmental Policy Act, (40 CFR 1502.25), it is our intention to include a copy of this request and the forthcoming biological opinion in the Draft Environmental Impact Statement being prepared for proposed OCS Lease Sale No. 68. This document is scheduled to be sent to the printer during the week of April 20, 1981. Your cooperation in helping us to meet this deadline will be appreciated.

Donald P

Deputy Assistant

ADDRESS ONLY THE DIRECTOR,
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OES BLM/GS-81-1

Memorandum

FEB 6 1981

To: Director, Bureau of Land Management
Director, U.S. Geological Survey

From: Acting Director

Subject: Section 7 Consultation - Southern California Bight
OCS Lease Sale No. 68

We have received your joint request for Section 7 consultation on OCS Oil and Gas Leasing Sale No. 68 in the Southern California Bight. As we have done in the past, the consultation will focus on the leasing and exploration phases of OCS activities, but will consider the development, production, and transportation phases to the extent possible based on the limited amount of information available at this time.

Because of the complexity of the consultation, I am appointing a Section 7 consultation team to carry out the consultation process. The following representatives are hereby appointed to the consultation team: Carl Benz, Sacramento Area Office; Jack Edmundson, Office of Endangered Species (OES); Dan James, OES, and Dick Mitchell, OES.

Through discussions with your staffs, a meeting has been arranged at the Pacific OCS Office in Los Angeles for February 17 and 18, 1981. Additional correspondence concerning this matter should be directed to Jack Edmundson, OES, (FTS 235-2760).

/sgd./F. Eugene Hester

cc: Regional Director R-1
Sacramento Area Office
Ralph Ainger, BLM
Mary Ann Turner, USGS
Consultation Team Members
    Carl Benz, Region 1
    Jack Edmundson, OES
    Dan James.OES
    Dick Mitchell,OES
Directorate Reading File
DD Chron
AFA Reading File
FWS/OES:JEdmundson:mbn - 235-2760
Draft - 1/29/81 Final - 2/3/81

Attendance on February 17, 1981
Section 7 Consultation
Southern California OCS

Gordon Reetz	BLM	FTS 798-7121
John Lane	BLM	FTS 798-6741
Brian Balcom	BLM	FTS 798-6750
Maurice Hill	BLM	FTS 798-6755
Carl Benz	U.S. FWS Sacramento Endangered Species Office	FTS 448-2791
Jack Edmundson	FWS-Wash. Endangered Species Office	FTS 235-2760
Dan James	FWS-Wash. Endangered Species Office	FTS 235-2760
Tom Dunaway	USGS - Los Angeles	FTS 798-2846
Steve Smith	BLM	FTS 798-6744
Ralph Ainger	BLM	FTS 343-6264
Jim Lecky	NMFS	FTS 796-2518
Joan Licari	USGS	FTS 798-2846
Mary Elaine Washurst	USGS-LA	FTS 798-2846
Lynnette Vesco	BLM	FTS 798-6745
Tom Cook	BLM	FTS 798-6752

Appendix F

National Marine Fisheries Service - Biological Opinion

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Washington, D.C. 20235

MAY 8 1981 F/MM2:CK

RECEIVED
MAY 8 1981
OFFICE OF THE DIRECTOR
BUREAU OF LAND MANAGEMENT

Mr. Edward L. Hastey
Acting Director
Bureau of Land Management
Department of the Interior
Washington, D.C. 20240

Dear Mr. Hastey:

Enclosed is the biological opinion prepared by the National Marine Fisheries Service (NMFS) pursuant to Section 7 (b) of the Endangered Species Act of 1973, as amended, concerning the impacts of oil and gas leasing and exploration on the outer continental shelf (OCS) in the area from offshore Point Conception, California south to offshore the U.S.-Mexico border (the Southern California Bight) on threatened and endangered whales and sea turtles.

The NMFS is reviewing the status of Vema hyalina, a small deep water mollusc whose known range is included in the project area. Section 7(a)(3) of the ESA requires Federal agencies to "confer with the Secretary on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed...." Although not yet formally proposed for listing as endangered, we believe that Vema hyalina should be included in this consultation to avoid future complications and delays. Therefore, we have included, with the concurrence of your Pacific OCS office, the results of our discussions and investigations on the impacts of oil and gas leasing and exploration on V. hyalina in this biological opinion.

We have determined from the available information that leasing and exploration of the OCS in the Southern California Bight Region is not likely to jeopardize the continued existence of any threatened or endangered whale or sea turtle. We also have concluded that the continued existence of V. hyalina is not likely to be jeopardized by the proposed activity.

The NMFS is concerned about the potential adverse impacts on gray and right whales found off the west coast of the United States, Canada, and Mexico from cumulative OCS activities both existing and planned. Addressing the issue of cumulative effects of OCS activities will enable the concerned agencies to resolve potential conflicts between endangered species and OCS activities before the issue of jeopardy is raised.

Consultation must be reinitiated if there are subsequent modifications of the proposed action or if new information reveals impacts of the identified activity that may affect listed species, or if a new species is listed that may be affected by the proposed activity. Consultation also must be reinitiated before development and production activities occur on tracts in the Southern California Bight that were not considered in the Biological Opinion NMFS rendered on September 25, 1979.

I look forward to continued cooperation in future consultations.

Sincerely yours,

William H. Stevenson

for Terry L. Leitzell
Assistant Administrator
for Fisheries

Enclosure

Endangered Species Act

Section 7 Consultation - Biological Opinion

AGENCIES: Bureau of Land Management and U.S. Geological Survey

ACTIVITY CONSIDERED DURING CONSULTATION: Operations pertaining to oil and gas leasing and exploration in the area offshore from Point Conception, California south to the U.S./Mexico border.

CONSULTATION CONDUCTED BY: National Marine Fisheries Service

BACKGROUND: In a letter dated January 16, 1981, the Bureau of Land Management (BLM) requested, on behalf of the BLM and the U.S. Geological Survey (USGS), initiation of formal consultation pursuant to Section 7 of the Endangered Species Act of 1973, as amended (ESA), to consider impacts on threatened and endangered species from all operations pertaining to oil and gas leasing and exploration on the Outer Continental Shelf (OCS) in the Southern California Bight.

This area includes approximately 6.6 million hectares offshore from Point Conception, California south to the U.S./Mexico Border, from three nautical miles (nm) offshore out to a distance of 210 nm. This area has been divided into approximately 2,900 whole and partial tracts, each whole tract being approximately 9 square statute miles.

Based on geological features the Southern California Bight may be divided into three subareas. These are (1) Santa Barbara Channel bound on the north by the coast from Point Conception east to Ventura and on the south by the Northern

Channel Islands; (2) the inner bank area containing the area east of southeast of Anacapa Island, the Santa Monica Basin, and San Pedro Bay out to Santa Catalina Island; and (3) the outer bank area, which follows the Santa Rosa-Cortez Ridge, contains Santa Rosa Ridge, San Nicolas Basin, Dall Bank, Southeast Tanner Bank, and Santo Tomas Knoll.

From 1966 to 1979, four lease sales were held in the Southern California Bight. One hundred and eighty-two leases were sold, 96 of which were active as of March 1981 (USGS, 1981). The distribution of the active leases is as follows: 82 in the Santa Barbara Channel, 6 on the inner bank, and 8 on the outer bank (BLM, 1980A). Through February 1981, 185 exploratory wells had been drilled in the Southern California Bight (USGS, 1981). The majority of these wells were drilled in the Santa Barbara Channel where 11 oil fields have been identified. Only two fields have been identified in the inner bank area, specifically in the San Pedro Bay, and no economically recoverable oil and gas deposits have been discovered in the outer bank area. In the most recent call nomination (proposed Lease Sale Number 68) the oil industry expressed an interest in exploring an additional 609 tracts.

If hydrocarbons are present in economically recoverable quantities, the lessee(s) must submit a proposed development and production plan, and an accompanying Environmental Report to the USGS for approval before development commences. In addition, compliance with the OCS Lands Act Amendments of 1978 requires that at least one development and production plan EIS be prepared by the Department of Interior for any given OCS area or region (as defined by the Secretary of Interior). An EIS was prepared by the Department of Interior on the development of oil and gas resources in the Santa Barbara Channel in 1976: subsequent comprehensive Environmental Assessment/Environmental Impact Report documents have been completed in several other areas. These documents will be reviewed by NMFS on a routine basis and will be scrutinized in future consultations which will address impacts of the development phase on threatened and endangered species.

The development phase includes the placement of platforms, drilling production wells, treating oil at either offshore or onshore separating facilities, and transporting natural gas and treated crude oil from the project area. This phase has been initiated in the Southern California Bight. There are currently 12 platforms installed and four platforms proposed for installation in the Southern California Bight. The USGS and National Marine Fisheries Service (NMFS) consulted on these activities and a biological opinion concluding no likelihood of jeopardy to the continued existence of the threatened or endangered whales and sea turtles was rendered on September 25, 1979.

In their January 16, 1981 request for consultation BLM and USGS indicated that a regional approach to consideration of leasing and exploration would be more efficient and economical than the sale-by-sale approach used previously. We agree that review of long term projects in an ecologically definable region such as the Southern California Bight, may be accomplished most efficiently by a regional approach. Such a regional or "aggregate" consultation, as described in 50 CFR Section 402.04(a)(3); 43FR871, is the best method to comply with the consultation requirements of Section 7(a)(2) of the ESA because the potential impacts of OCS leasing and exploration activities from individual lease sales within a given region will be similar. Furthermore, a regional consultation will identify potential problems and additional information needs at an early stage in the regional OCS program.

This consultation was conducted through review of published and unpublished data provided by BLM, USGS, and NMFS; a meeting between NMFS, U.S. Fish and Wildlife Service, BLM, and USGS held on February 17 and 18, 1981 at BLM's Pacific

OCS office for the purpose of exchanging information and clarifying issues; and a number of phone calls to BLM and USGS for further clarification and additional information. A list of references utilized in preparation of this opinion is included.

Although the entire range of OCS activities was considered in the consultation process, this Biological Opinion addresses only the OCS leasing and exploration activities in the Southern California Bight. When available, NMFS will review future lease sale and exploration plans as well as the results of BLM-funded and other investigations into the impacts of oil and gas development to determine whether consultation pursuant to Section 7 of the ESA for the Southern California Bight OCS oil and gas lease and exploration program must be reinitiated. Further, when the development and production phases are reached and as information on the specific impact of the activities, including the cumulative impact of the program, becomes available formal consultation will be reinitiated.

Proposed Activity

BLM's current 5-year OCS leasing schedule, which ends in February 1985, identifies three lease sales (numbers 68, 73, and 80) in California and up to four reoffering sales which may include tracts in the Southern California Bight that were offered but not sold in sales previous to the reoffering sale. BLM has proposed modifying this schedule by extending it through June 1986 and adding 2 more lease sales (Numbers 91 and 96) and 1 more reoffering sale. BLM is unable to predict the number of additional sales that may be required to allow for complete exploration of the Southern California Bight.

Prior to leasing, geophysical exploration is done in order to determine the hydrocarbon potential of an area. This involves towing an acoustical device, which generates a shock wave, and an array of recorders. The manner in which the shock waves are reflected or refracted toward the recorders is indicative of bottom geology.

There were 32 such surveys conducted in the Southern California Bight in 1978, 13 in 1979, and 11 in 1980. Through the end of March 5 permits had been issued for geophysical exploration of the Southern Califonia Bight in 1981. USGS does not expect an increase in the rate of geophysical exploration because of the availability of vessels and equipment. We anticipate no adverse impacts on listed species from this level of geophysical exploration.

The leasing of tracts initiates a sequence of events which may impact endangered species. After a lease has been issued, the lessee will undertake certain environmental studies for the purpose of developing an exploration plan and environmental report and for compliance with OCS orders, Notices to Lessees, and Sales specific stipulations. These may include studies to provide descriptions of the air quality, sea state, and flora and fauna in the tract area that may be disturbed by exploration activities. Geological studies may involve bottom drag sampling or shallow coring. Biological studies may employ certain high resolution geophysical instrumention, i.e., fathometers to determine water depth, water column bubble detectors to detect marine life and side-scan sonar to map sea bottom irregularities. These studies use accepted sampling techniques which are passive in nature and localized in range. No impacts on endangered species are anticipated from these studies.

Drilling of exploratory wells is permited after exploration plans and environmental reports are approved by USGS. Mobile drilling rigs that will be utilized to drill these wells include temporary jack-up rigs, exploratory drilling ships, and semi-submersible drilling platforms. The type of platform utilized at a specific site depends on paramenters such as water depth, bottom topography, and availability of drill ships.

From 1976 through 1980 the mean rate of exploration in the Southern California Bight was 16 wells per year. The peak rate of exploration was 29 wells in 1977. The number and location of platforms required to complete exploration of the Southern California Bight are unknown. Exploratory wells are still being drilled for the purpose of deliniating the boundaries of discovered deposits. The rate of exploration could rise as high as 30 wells per year, but is expected to remain somewhat lower because of availability of exploratory vessel time. The rate of exploration appears to oscillate as a function of lease sale dates, with number of wells drilled peaking in the third year after the sale. After three years, the number of exploratory wells drilled declines as leases expire. The 5-year leasing schedule could have the effect of expanding the peaks into a 3 to 5-year plateau. The potential impacts of exploratory drilling are discussed below.

Status of Species Considered in this Opinion

Common Name	Scientific Name	Status
Gray Whale	(Eschrichtius robustus)	Endangered
Right Whale	(Eubalaena glacialis)	Endangered
Blue Whale	(Balaenoptera musculus)	Endangered
Fin Whale	(B. physalus)	Endangered
Sei Whale	(B. borealis)	Endangered
Humpback Whale	(Megaptera novaeangliae)	Endangered
Sperm Whale	(Physeter catodon)	Endangered
Green Sea turtle	(Chelonia mydas)	Endangered
Leatherback Sea Turtle	(Dermochelys coriacea)	Endangered
Pacific Ridley Sea Turtle	(Lepidochelys olivacea)	Endangered
Loggerhead Sea Turtle	(Caretta caretta)	Threatened
Monoplacophoran	(Vema hyalina)	Under Review

All of the cetaceans listed exhibit similar north-south migratory patterns, utilizing high latitude cold water feeding grounds in summer and low latitude warm water calving and breeding grounds in winter. Although the limits of the feeding grounds, breeding and calving grounds, and migratory paths vary from species to species, at least part of the North Pacific population of each species may be found in waters of the Southern California Bight at some point during their annual migratory cycle. Sea turtles rarely occur in the project area. They probably are represented by individuals that have migrated to the northern limits of their ranges.

The gray whale is seasonally the most abundant whale in the project area. Because of its coastal migratory path between its northern feeding grounds and its calving grounds in the lagoons of Baja California, Mexico, essentially the entire gray whale population migrates through the project area twice annually. The southern migration through the project area occurs from November to January. Some immature gray whales may remain in the project area during winter loafing and may be feeding in the kelp beds along the coast and around the Channel Islands (Wellington and Shane, 1978). The return migration through the project area occurs from February through May. During the three year BLM Cetacean Survey only one sighting was made during the summer months (Dohl et al., 1978) indicating that gray whales do not reside in the Southern California Bight during the summer in significant numbers. The eastern North Pacific stock is estimated at 15,000 whales (Rugh, 1979). Because it is the most abundant large whale in the project area the gray whale is the most likely to be impacted by OCS activities.

The most depleted stock considered in this consultation is the North Pacific population of the right whale. It is estimated to number between 100 and 200 individuals (Wada, 1972). The distribution of this species is poorly known. Its summer feeding grounds are located in the Gulf of Alaska, along the Aleutian Islands, and in the Bering Sea. Practically nothing is known about its winter distribution. Other populations of this species are known to utilize coastal bays as winter calving grounds. No calving grounds have been identified for the North Pacific population. This is somewhat surprising, considering the interest the Yankee whalers had in this species and the amount of whaling that has occurred along the North Pacific coast. In recent years right whales have been sighted off Baja California, suggesting that this population, like most baleen whales, probably exhibits a seasonal shift to the south in the winter. On April 17, 1981 a right whale was sighted in the Santa Barbara Channel (Woodhouse, personal communication). This is the first reported sighting of a right whale in the Southern California Bight since 1956 (Gilmore, 1956). Although no right whales were sighted during the BLM funded 3 year marine mammal survey of the Southern California Bight (Dohl et al., 1978), this most recent sighting confirms that right whales occasionally can be found in the region.

Part of the North Pacific population of blue whales, which numbers approximately 1,700 (DOC, 1978), migrates through the project area from May through July on the way to its summer feeding grounds and again from September to Febr ary during migration to its wintering grounds in the warm waters off southern Baja California. Even when migrating the blue whale probably occurs offshore most of the time. Blue whales can be found in the project area from June through December. Their distribution is known to be as close as 15 nm to the mainland coast in the Santa Barbara Channel, north of Santa Rosa Island, and generally along the Santa Rose-Cortez Ridge to Tanner and Cortez Banks (Dohl et al., 1978). In 1980 a blue whale was brought into Los Angeles Harbor draped across the bow of a tanker. This whale/vessel conflict was documented by the Los Angeles County Museum of Natural History (Accession Number A800706).

The North Pacific population of fin whales numbers about 17,000 and is widely distributed (DOC, 1978). The migratory pattern of this population is least well defined of all the large whales. Fin whales may be found in the project area year round, with greatest abundance from June through September (Dohl et al., 1978).

Sei whales are estimated to number about 9,000 in the North Pacific (DOC, 1978). They have been sighted in the Southern California Bight. They appear to be a more offshore species associated with the deep waters of the continental slope. The only sightings made during the three year BLM survey occurred in September 1975, when two groups totaling five whales were seen west of Tanner-Cortez Banks (Dohl et al., 1978). Apparently there is a southerly and offshore shift in their distribution during winter.

The humpback whale is one of the most depleted of the whales. The North Pacific population is approximately 1,000 whales (DOC, in press). A portion of this population migrates from its summer grounds in Alaska south to its calving and breeding grounds off the west coast of Baja California, where it spends the winter months. Their summer and winter ranges appear to overlap in the Southern California Bight and humpbacks may be found in the in the project area during portions of all seasons. Their peak abundance occurs in summer and fall (Dohl et al., 1978). During a cetacean capture cruise for Seaworld, two humpback whales were observed feeding on anchovies over the Santa Rosa Ridge. The importance of this area to the food resources of the humpback whale is unknown.

The sperm whale is the most abundant large whale in the North Pacific Ocean. Its population is about 300,000 and is widely distributed (DOC 1978). This pelagic species usually is not associated with near shore waters. The migration path of the sperm whale generally passes seaward of the Southern California Bight; sightings of this species in the project area are rare (Dohl et al., 1978).

The four species of sea turtles included in this consultation generally are distributed to the south of the project area. Records of stranded green and leatherback sea turtles as far north as British Columbia, Canada and Pacific ridley sea turtles as far north as Humboldt County, California (Stebbins, 1966) indicate that occasional transients may wander through the project area. Stebbins (1966) lists the northern limit of the range of loggerhead sea turtle as southern California.

The NMFS is considering a proposal to list Vema hyalina (Mollusca: Monoplacophora) a small limpet-like mollusc, as an endangered species. The 1979 amendments to the ESA require Federal agencies to confer with the NMFS on any agency action which may jeopardize populations of proposed species. We believe that, although not yet formally proposed for listing, V. hyalina should be included in this consultation, in order to avoid future complications and or delays in the OCS program in the Southern California Bight. Therefore NMFS requested BLM and USGS to include V. hyalina in their request for consultation. BLM and USGS complied with this request and the results of our discussions and investigations are incorporated in this biological opinion.

V. hyalina is a recently discovered species in the Southern California Bight. It is a living representative of a class of molluscs thought to have gone extinct in the Devonian (300 million years ago). There are no estimates of its abundance. The known range is between the collection sites at 32° 25' 48" N, 119° 13' 30" W (McLean, 1979) and 33° 04' N, 119° 34' W (Lowenstam, 1978) at depths of between 174 meters (McLean, 1979) and 403 meters (Lowenstam, 1978). All specimens recovered from these sites were living on phosphorite nodules. Their existence may depend on the availability of hard substrates. Although no information is available on their ability to survive on the adjacent soft sandy bottoms, some researchers believe V. hyalina should be able to cope with this type of substrate. The absence of this species in bottom samples collected at other nearby locations could be attributed to the general lack of suitable substrate, the extreme fragility of the organism, and problems associated with raising them from depth intact, or the insufficient scrutiny of those sorting through the samples. The largest specimen collected to date is 2.3 mm in length (McLean, 1979).

Potential Impacts

Geraci and St. Aubin (1980) discussed potential impacts of all phases of OCS oil development on marine mammals. Potential impacts associated with exploration include oil pollution resulting from well blow outs or fractured formations; noise generated by geophysical exploration, drilling, and increased vessel traffic; and conflicts between vessels and whales. We believe sea turtles would be subject to the same impacts.

Potential effects of oil pollution on endangered species include fouling of the feeding mechanism (particularly baleen plates), disruption of respiratory function, ingestion of oil with unknown effects on physiology, reduction of food supplies through contamination or alteration of habitat, irritation of skin and eyes, and modification of migratory routes to avoid contamination by oil. Excessive noise could be responsible for changes in migration routes, abandonment of feeding areas, and stress which could affect reproductive potentials. Increased vessel traffic possibly will result in more vessel and whale or sea turtle collisions. These are almost always injurious and usually fatal to the animal involved. We are unable to predict the number of collisions that would occur and therefore their impacts on the populations.

BLM has funded several studies to investigate these impacts (BLM, 1981B) including studies of "Effects of Oil on Marine Mammals", "Effects of Oil on the Feeding Mechanism of the Bowhead Whale", "Effects of Sound on Marine Mammals", and "Gray Whale Tagging Studies". When these studies are completed we shall have a better understanding of the effects of these impacts. We believe that the information obtained from these and other studies is essential for the realistic evaluation of the impacts of the OCS leasing program on endangered species.

The gray whale and the right whale are the species of greatest concern to us in the Southern California Bight. Because of its restricted breeding grounds and its migration corridor, which results in virtually the entire population migrating through the Southern California Bight twice each year, the gray whale is the species most likely to be impacted. Moreover, by 1985, there will have been 15 OCS lease sales and up to 5 reoffering sales within the U.S. portion of the gray whale's range. In addition, an undetermined amount of oil exploration and development by Canada and Mexico within their respective jurisdictions along the gray whale's migration route will occur. Abandonment of either its traditional migration route, breeding grounds, or preferred feeding grounds in the Bering and Chukchi Seas could jeopardize the continued existence of the gray whale. Although we are unable to identify the threshold of OCS development that may cause gray whales to abandon preferred habitat, we are concerned about the increasing amount of OCS activity off the west coast and believe that the time has come to consider the potential threats posed by cumulative OCS activities in this region. We believe that addressing the issue of cumulative impacts at this time will enable the agencies involved in this activity to resolve potential conflicts betwen OCS activities and endangered species before they become severe enough to result in the likelihood of jeopardizing the continued existence of a listed species. Studies such as those cited above may provide information to aid in addressing this concern.

If impacted, the right whale is the species most likely to suffer extinction. Its population is quite small and recruitment probably is no more than a few animals each year. Any impact resulting in the death of even a few animals essentially would negate a years' reproductive effort and further reduce the probability of the survival of this species. As stated above, there has been only one sighting (April 17, 1981) of a right whale in the Southern California Bight in 25 years. Because of the rarity of its occurance in the Southern California Bight and its small size, the probability of this population being impacted by activities associated with exploration of the OCS is low.

The other endangered whales considered in this consultation (blue, fin, sei, humpback, and sperm) consist of at least two populations (eastern Pacific and western Pacific) and generally are more pelagic in distribution than the gray whale. Impacts on these species from leasing and exploration in the Southern California Bight may affect only a few individuals of a species and are not likely to jeopardize the continued existence of these species.

The four species of sea turtles probably will not be signficantly affected by this leasing and exploration. Only occasional individuals at the extreme northern limits of their ranges are found in the Southern California Bight. Impacts on these individuals are not likely to affect the populations as a whole, and therefore, are not likely to jeopardize the continued existence of any of the species.

The greatest potential threat to V. hyalina is probably from sedimentation of discharged drilling muds and cuttings. Houghton et al. (1981) stated that impacts on benthic organisms from discharged muds and cuttings are inversely related to the hydrodynamic energy level and depth of the water column. Since the known distribution of V. hyalina is in a high energy area relative to the rest of the southern California Bight, and in water deeper than 174 meters, we expect V. hyalina will experience little or no increase in current rates of sedimentation.

Specific Concerns for Activities of the Pre-Exploration and Exploration Phases Are Given Below

1. Pre-exploration phase

Prior to exploration of a tract a lessee must comply with the OCS orders, Notices to Lessees, and sale specific stipulations. This includes conducting geophysical surveys to insure proposed drilling sites are stable and environment surveys to characterize the area which may be altered by exploratory drilling.

At this time we are unable to adequately assess the impacts of geophysical exploration on whales and sea turtles. The shock waves generated by acoustical devices used in geophysical exploration probably are not injurious to marine mammals (Geraci and St. Aubin, 1980) or sea turtles. Increased levels of noise may reach a threshold which could cause a shift in the migration route of the gray whale. Current levels of noise appear to be below any such threshold and USGS anticipates no large increase in levels of geophysical exploration due to the availability of vessels and equipment. Therefore, we believe gray whales are not likely to be adversely impacted by this activity. A recommendation is made below to continue monitoring the migration of gray whales to insure that gray whales are not being adversely impacted by this activity.

The environmental studies conducted during this stage probably will not affect whales or sea turtles. Bottom and core sampling techniques used in the outer bank area could result in collection of V. hyalina, which could have an adverse effect if the population is as small and localized as some researchers believe.

2. Exploration phase

The type and location of exploratory platforms are not known. Information regarding the location and time span required for drilling each well will be included in exploration plans submitted to USGS. These plans and the accompanying environmental reports will be reviewed by the NMFS to determine if additional Section 7 consultations are required.

Noise resulting from drilling and support vessel traffic may alter gray whale behavior and migration. An accidental oil spill could damage the feeding mechanism, impair vision, disrupt respiratory and digestive systems, and cause other effects as discussed above. Increased sedimentation resulting from drilling exploratory wells may impact _V. hyalina_. At present, insufficient information exists to determine the magnitude of these effects, if any. Research being funded by BLM may provide information that will enable us to determine the nature and extent these types of impacts on threatened and endangered species.

Conclusions:

Based on the facts that the North Pacific populations of the blue, fin, sei, humpback, and sperm whales are widely distributed, generally are thought to consist of a least two stocks (eastern Pacific and western Pacific), and utilize broad migration corridors, NMFS concludes that leasing and activities associated with exploration are not likely to jeopardize the continued existence of these species. The NMFS also concludes that these activities are unlikely to jeopardize the continued existence of the listed sea turtles because they generally are distributed in warm tropical or subtropical waters. Individuals encountered in the cold temperate waters of the Southern California Bight probably are expatriates at the extreme northern limits of their ranges.

We believe exploration of the Southern California Bight for oil and gas deposits is not likely to jeopardize the continued existence of the gray whale because the probability of severe adverse impacts to a large portion of the population is very low. In view of the relatively restricted migration pattern of gray whales, the poor understanding of the gray whale's response to noise generated by OCS exploration and development, the general lack of knowledge concerning the effects of spilled oil on cetaceans, and the extensive OCS development that is scheduled to take place within the range of the gray whale in the next five years, NMFS is concerned that the cumulative effects of these activities may have significant adverse effects on the gray whale. The NMFS believes that Section 7 of the ESA requires consideration of the cumulative effects of an action upon listed species and their critical habitat to determine whether that action will violate Section 7(a)(2).

Because of the sparse information on the gray whale and relatively short history of OCS activities in the Southern California Bight and off the coasts of Alaska, Canada, and Mexico, we are unable to identify a threshold of OCS activities that would result in signficant impacts to the gray whale. Nevertheless, we believe that all involved agencies must consider cummulative effects from all OCS activities, including those of Canada and Mexico to insure that collectively they are not likely to jeopardize the continued existence of the gray whale.

The North Pacific population of the right whale is so small that an adverse impact to a few individuals could be a severe impact to the population. However, right whales are seen so infrequently in the Southern California Bight that the proposed activities are not likely to impact even one right whale. Therefore, we have concluded that proposed activities are not likely to jeopardize the continued existence of the right whale. As discussed above NMFS believes BLM and USGS must consider the cumulative effects of all OCS ativities to insure that collectively they are not likely to jeopardize the continued existence of the right whale.

The NMFS will monitor OCS activities and review new information concerning listed species for indications of cummulative impacts. The studies funded by BLM may provide information that will help identify such impacts.

There appears to be no jeopardy to the continued existence of V. hyalina from OCS exploration because of the assumed moderate to low oil potentials in the outer bank area. There have been 7 exploratory wells drilled within the known range of this species. None of these has indicated the presence of economically recoverable reserves of oil or gas, and 26 of the 29 leases awarded in this area have expired. The industry, however, continues to express an interest in exploring this area. The rate of exploration is expected to be less enthusiastic than in the Santa Barbara Channel or inner bank area.

Recommendation:

We recommend that BLM continue their OCS studies program and maintain close coordination with NMFS and the Marine Mammal Commission in the development of studies to investigate the impacts of exploration for and development of OCS oil and gas reserves on threatened and endangered species.

We recommend that BLM continue to fund studies, such as the gray whale tagging study, which include monitoring of gray whale migrations and the behavior of gray whales in the vicinity of pre-exploration and exploration activities to insure that gray whales are not being excluded from preferred migration corridors by OCS activities.

We are not recomending implementation of a seasonal drilling restriction in the Southern California Bight, because we believe that the gray whale migration corridor in the Southern California Bight is sufficiently wide to accomodate both exploration and migration.

Exploration at the rate anticipated by USGS is not likely to add significantly to noise levels generated by the numerous commercial and pleasure vessels utilizing the Southern California Bight. For this reason we believe that the Southern California Bight is an excellent natural laboratory in which studies of gray whale reactions to drilling vessels, acoustic devices, and other exploration related stimuli can be conducted. We recommend that BLM take advantage of this situation by funding studies to observe gray whale migrations from various drilling platforms and geophysical exploration vessels and make an effort to correlate observed behavior to acoustic profiles presented by each platform. The results of such studies may have direct application to decisions on exploring in areas more critical to gray whales such as the Bering sea, and may provide information which could be extrapolated to other species of large whales.

Finally, we recommend consultation be continued informally through the exploration phase as development information becomes available so that NMFS will be prepared to conduct consultations on the development and production phase of OCS oil and gas development.

Reinitiation of Consultation

Consultation should be reinitiated: (1) if new information reveals impacts of the identified activity or program that may affect listed species or their habitats; (2) if the proposed activities are modified; (3) or if a new species is listed that may be affected by the proposed activity or program. Consultation also should be reinitiated before development and production activities occur on the tracts included in this consultation.

Reinitiation of consultation pursuant to Section 7 of the ESA may not be necessary for all additional exploration activitives. Additional lease sale plans, modifications of existing plans, or additional information should be sent to the Director, Southwest Region, National Marine Fisheries Service, for review. NMFS suggests that the agencies involved in this consultation continue to discuss

the information concerning future OCS activities so that, if needed, consultation can be reinitiated in timely manner. This in no way would preclude any involved agency from making an independent determination of the need for reinitiating consultation.

Nothing in this Biological Opinion should be construed as authorizing any takings (as defined in Section 3 of the ESA) of endangered or threatened species pursuant to Section 10(a) nor immunizing any actions from the prohibitions of Section 9(a) of the ESA.

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